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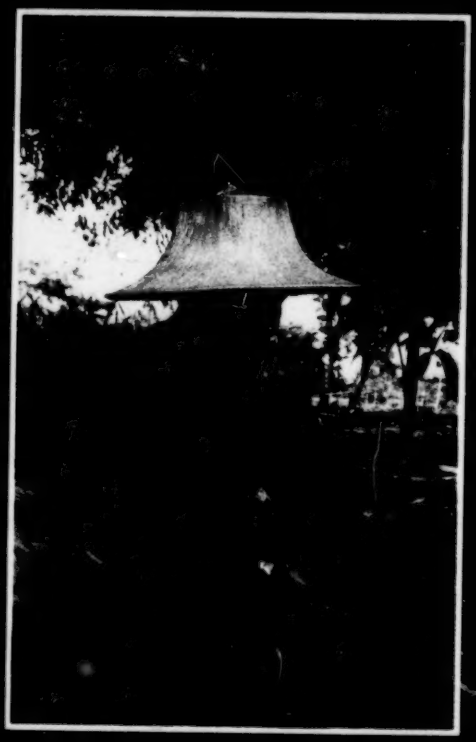
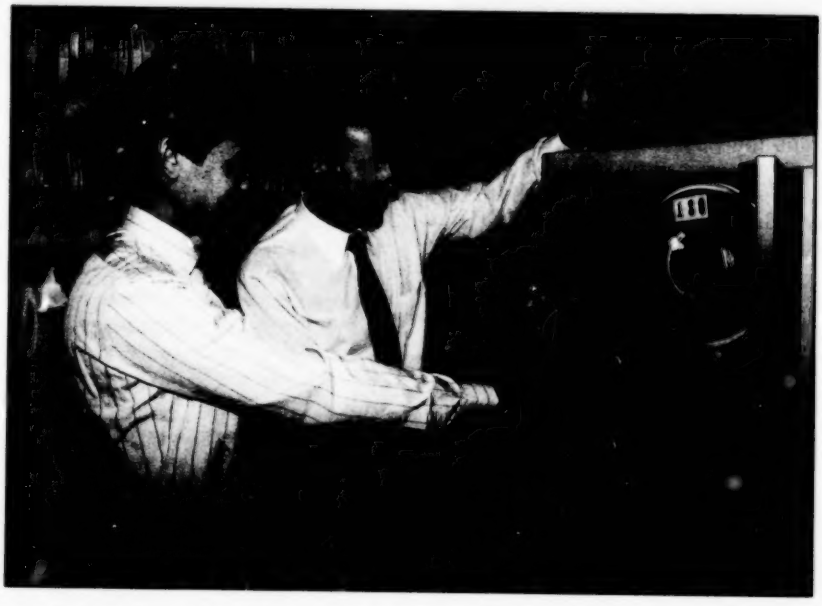


INTRODUCTION

Commodities have always formed a structural centre-piece in the economies of developing countries. These products are sometimes minerals, but more often are of agricultural origin. Their existence was in many instances the excuse for colonization in centuries past; their exploitation often to the neglect of other economic activity — including even the production of food crops for local consumption — continues today to be a major challenge to economic planners. A common goal of governments is the diversification of economies to decrease dependency on commodities as a source of foreign exchange. Notwithstanding those efforts, primary products still account for more than 35% of the value of all developing-country exports. For those countries designated by the United Nations as "least developed," the figure is 73%.

Commodity dependency has never been a satisfactory circumstance. It is even less so for those countries that export a single primary product. In addition to all of the environmental hazards faced by farmers worldwide — uncertain rainfall, inadequate soil nutrients, pestilence, access to credit — the issues of effective demand and price are ever present. As farmers and consumers have known for millennia, produce prices are as supple as the stem of a rice plant. Governments that depend on income generated by sales of commodities in world markets face the fact that their economies are hostages to fortune.

In recent years, the fortune has not been bright. A number of factors, not all as yet fully understood, are responsible. For example, the same technologies that have



An informatics specialist explains to IDRC's President, Ivan L. Head (right), the functioning of data banks.

contributed to extraordinary gains in agricultural production in Asia in recent years have also permitted immense efficiencies and yields in the traditional grain-exporting nations; a number of industrialized countries have recently adopted agricultural policies that heavily subsidize farm produce; manufacturers are increasingly turning to lower cost synthetics and other substitutes in place of traditional raw materials, be they of fibre or mineral origin; and protectionism in many industrialized countries is now limiting access even to classical nonvalue-added items.

The combination of these circumstances has led to a precipitate drop in commodity prices. All commodity producers, from all parts of the world, are affected. But placed at highest risk are the less-resilient economies of the developing countries. Since 1980, the prices of primary commodities have dropped at an annual average rate of 7.4%. Not counting oil, dollar prices for tropical commodities are now some 30% lower than their 1980 levels. The loss of income to developing countries in 1985 alone is estimated at US $50 billion. Because these countries for the most part service their foreign debts with funds earned by the export of their commodities, their ability to keep their payments current is severely affected. For reasons quite beyond their control, interest rates have risen while commodity prices have fallen.

To understand better these economic circumstances, developing countries are conducting their own research programs and are acquiring the competence to devise more effective policies and to choose wisely from the limited range of options open to them. Research of this sort demands an ability to access large masses of statistical information and to utilize sophisticated computer techniques for its proper analysis. Research of this kind won't raise commodity prices, but it may permit wiser responses to threatening circumstances.

In an earlier and seemingly less-complicated age, Thoreau argued that "it is not enough to be busy, the question is, what are we busy about?" The pages that follow reveal what developing-country researchers have been busy about, and how IDRC has supported their endeavours.

Ivan L. Head
President, IDRC

WHAT IS IDRC?

The International Development Research Centre (IDRC) is a corporation created by the Parliament of Canada in 1970 to stimulate and support scientific and technical research by developing countries for their own benefit.

The fields of investigation to which IDRC gives its financial and professional support include farming; food storage, processing, and distribution; forestry; fisheries; animal sciences; energy; tropical diseases; water supply and sanitation; maternal and child health; education; population studies; economics; urban policies; science and technology policy; information systems; earth sciences; and dissemination of research results.

Although IDRC is funded entirely by the Canadian Parliament, to which it reports annually, its operations are guided by an international 21-member Board of Governors. Under the IDRC Act, the chairman, the vice-chairman, and 9 other governors must be Canadian citizens; in practice, 6 of the remaining 10 governors are from developing countries.

The Centre's programs help developing countries to build the scientific competence of their institutions and their researchers so that these countries can work to solve their own problems. Opportunities are given to researchers to broaden their experience through practical work assignments or advanced studies.

IDRC emphasizes the role of the scientist in international development and encourages Third World countries to draw on the talent of their own scientific communities. Building a strong local base for future research is an important objective of most IDRC-supported work. Research projects are identified, designed, conducted, and managed by developing-country researchers in their own countries, to meet their own priorities.

IDRC helps to create and supports international research networks through which developing countries can learn from each other, share common experiences, and conduct similarly designed studies in areas of mutual concern. It also promotes cooperation between developing-country researchers and their counterparts in Canada.

Research Programs

Agriculture, Food and Nutrition Sciences — In this group of related sciences, emphasis is on farming systems, social forestry in arid and semi-arid lands, and aquaculture. Specific areas of support include previously neglected food sources such as root crops, food legumes, and oilseeds; agroforestry (growing trees and crops together); multiple cropping systems; improvement of pasturelands; use of nonconventional feeds for animals; fish and shellfish farming; postproduction systems for the preservation, processing, and distribution of food crops, fruit, and fish; and the economics of small-scale farm production and marketing.

Health Sciences — The division's support is concentrated in five broad areas of applied research: health services; water supply and sanitation; maternal and child health; tropical and infectious diseases; and occupational and environmental health.

Social Sciences — Research supported by the division is designed to improve understanding of the social and economic issues related to international development, permitting researchers and policymakers to formulate policy options in several thematic areas. These include

education, population, science and technology, energy, urban development, economics, and rural development. Support is also given to a limited number of national and regional institutions in the social sciences and to research on problems of special regional concern.

Energy — In 1981, the Canadian government decided to grant IDRC an additional $10 million to enable it to finance a greater number of energy-related research projects. Most of this supplementary fund has already been allocated to projects, and within the next 2 years the whole amount will have been used. IDRC will, however, continue to support energy research. The energy fund has made it possible to pay closer attention to issues such as energy policy and the evaluation of energy sources, supply mechanisms, patterns of consumption, and alternative technologies in developing countries. Several projects designed to make use of renewable energy for domestic needs (cooking food, supplying water) and in farming (drying the harvest) have been approved. IDRC has also financed regional information centres that specialize in energy-related topics and has granted several training awards in the field of energy. Also, working with the United Nations University in Tokyo, the Centre made a contribution to the establishment of a prestigious international Energy Research Group whose final report will be published in 1987.

Information Programs

Information Sciences — Support given by the division helps developing countries to establish regional and national information systems and improve library infrastructures at these levels; participate in international information networks; create specialized information centres (serving the region or world) on development-related subjects; strengthen sectoral information programs, especially in agriculture, health, population, industry, the environment, cartography, and social issues; and develop information tools and methods. The division's computer systems group provides internal services and distributes MINISIS, a bibliographic software package designed by IDRC, to developing countries. In addition, a library and micrographics unit serve IDRC staff, the Canadian development community, and IDRC-supported projects.

Communications — Services provided by the division include the publication and dissemination of the results of IDRC-supported research via print and film media, public affairs, and translation. The division also aims at strengthening the ability of research institutions in developing countries to prepare and disseminate scientific and technical information particularly on projects supported by IDRC.

Collaborative Programs

Cooperative Programs — The division promotes collaboration between scientific research groups in developing countries and their counterparts in Canada — whether academic, governmental, or private. By establishing channels of communication among scientists, the division helps improve the transfer of research results from Canada to the Third World. Project support is, however, open to all disciplines that contribute to Third World economic or social development and in which there is recognized Canadian expertise. It is important that the developing-country research group plays a significant role in formulating a scientifically sound project proposal and in planning and executing the project, thereby strengthening its research capacity.

Fellowships and Awards — The division funds the training of junior and senior Third World scientists, managers, and planners working in sectors covered by IDRC's program divisions. Preference is given to individuals from the least-

Well-informed and motivated mothers have a major role in decreasing infant mortality rates.

developed countries and the emphasis is on professional upgrading rather than basic training. In addition, the division supports practical, nondegree group training to improve technical, research, and administrative skills of individuals. A portion of the division's funds is also used to encourage the involvement of young Canadian researchers in scientific areas of concern to IDRC and to expose them to the problems of the developing world. These doctoral students are posted to a Third World country for studies, research, or placement.

Funding and Selection of Projects

Each program division channels funds to institutions in developing countries (government departments, universities, research centres, etc.), to international and regional institutions, and to Canadian institutions. The recipient is expected to pay a portion of the costs.

All projects are reviewed by IDRC's professional staff and assessed in light of factors such as

- Development priority: Is the proposal consistent with national or regional development goals?
- Regional applicability: Are the research findings likely to be applicable in developing countries or regions other than the one in which the research takes place?
- Usefulness: Will the research help close gaps in living standards or lessen the imbalance in development between rural and urban areas?
- Local resources: Will the project make full use of local resources and research workers from the region?
- Training: Will the project result in better trained and more experienced

researchers and more effective research institutions?

- Research area: Does the research fall within IDRC's areas of concentration?

When IDRC agrees to support a project, it enters into an agreement with the developing-country institution. In it are stipulated the project's purpose, research methods, payments, and a schedule for the research and progress reports.

The Program Officer

Although IDRC itself rarely undertakes research, its program officers are highly qualified professionals. One of their main functions is to respond to project ideas proposed by developing-country researchers and to evaluate the suitability of proposals in light of the criteria stated earlier.

Once a project has been approved in principle, the program officers collaborate with the institution submitting the proposal in further refining the project idea, provide administrative and technical advice, and help in preparing a project budget. Program officers are based either at IDRC headquarters in Ottawa or in one of the regional offices. In the regions, they help determine research priorities and prepare detailed annual plans of projects to be defined and developed, workshops and seminars to be organized, and maintain contact with research institutions throughout the region.

Project Approval

Before funds are appropriated, a project proposal must go through a formal approval process.

Authority to approve projects for which funding exceeds $100000 lies with IDRC's Board of Governors. It delegates approval authority to the President and the Vice-Presidents for projects up to $100000, to Directors of individual divisions for projects up to $50000, and to Deputy Directors for projects up to $15000.

When a project has been approved, funds are appropriated by the Office of the Comptroller General and Treasurer. The Secretary's Office prepares a Memorandum of Grant Conditions (MGC) governing all aspects of the relationship between the signing parties. Once the MGC has been signed by the recipient, funds can be forwarded.

EXTERNAL SUPPORT OF RESEARCH

The search for new knowledge and alternative ways of applying what is already known is a vital component of the development process. The contribution that relevant research can make to development has been increasingly recognized by Third World countries.

This introductory section will review some features of Third World research, focusing particularly on the contribution of development assistance in the field of research and on some attempts that have been made to assess the impact of research. It borrows heavily from data on some donor agencies' funding of development research collected by Professor John P. Lewis, who was Chairman of the Development Assistance Committee (DAC) of the Organisation for Economic Cooperation and Development (OECD) from 1979 to 1981, and from a preliminary report he has written for IDRC. (Professor Lewis is not responsible for the way material is presented here.)

The role of research has not always been perceived as clearly as it is today. In the 1950s, in the early days of what has now become the "economic development field," dominant theories of economic growth were so capital centred that they seemed to slight the effects of everything else. This itself was ironic, for, at that very time, econometric studies of the sources of growth in the industrial economies were finding that changes in the quantities of capital and labour explained only small fractions of growth performance. Instead, most of the latter reflected increases in the productivity of these physical factors. In turn, many of the productivity advances plainly were caused by the improving technology that was being generated by ongoing fundamental and applied research.

This view of the salience of research spread quickly to the Third World. It extended to almost all sectors. Agricultural progress was seen to hinge on supplying new technologies. The Green Revolution was research intensive. Industrial, energy, and transport advances reflected the abilities of applied research to adapt or innovate appropriate technology. Health and population programs were full of unanswered questions. The shape and context of optimal education programs and, indeed, the very role of education in development demanded analysis. The Third World was confronted by a major requirement for economic and other policy research. At the same time, it was clear that it could not rely solely on research imported from industrial countries; such knowledge had been generated and its application undertaken in an environment that differed markedly in terms of ecology, resources, characteristics of available factors of production, and social and cultural values. There were abundant examples of technology being incorrectly applied and inappropriate solutions being imported into developing countries.

This of course did not imply that developed-country research was irrelevant for developing countries, but that careful judgment of its usefulness in sometimes radically different circumstances was required. In addition, developing countries were faced with intractable problems that were of little or no importance to the so-called developed world.

The bulk of research undertaken in developed countries has been concentrated in sectors that play little role in the economies of developing countries. Thus, it was essential for developing countries to build up their capacity, both

to undertake research and to judge the quality and appropriateness of research undertaken elsewhere. This development of research capacity implied building new institutions and providing training and opportunities for on-the-job experience to individual researchers.

R&D in the Third World

It is extraordinarily difficult to provide an assessment of the amount of resources — both financial and human — that the Third World devotes to research. Where estimates exist, they are seldom constituted on a comparable basis; indeed, comparison of different sets of data may well reveal major discrepancies. There is a great need to improve the data available in this area. A distinguished observer, Mahdi Elmandjra, noted recently that "it was not until 1978 that the General Conference of the United Nations Educational, Scientific and Cultural Organization (Unesco) adopted the recommendation on the international standardization of statistics on science and technology. It will take many more years before we can dispose of relatively reliable and internationally comparable data on research and development expenditures."

Those estimates that do exist on developed- and developing-country overall expenditure on research and development (R&D) provide some basis for making a number of major points — such as the stark contrast between the proportion of world R&D expenditure being realized in and for the two sets of countries. It is at the individual country level, however, where major decisions must be taken about the allocation of resources to research, that the need for better information is most crucial. Along with others, IDRC hopes to play a role in facilitating the collection of information and quantitative data by countries to assist in planning future research expenditure.

In the case of agriculture, most countries have a better picture of the resources devoted to research than for other sectors, although even here the information is incomplete. The International Service for National Agricultural Research (ISNAR) is developing a data base designed to provide comparative information on agricultural research throughout the developing world; data will be based, where possible, on responses from countries themselves, supplemented by information from other primary and secondary sources.

Notwithstanding the difficulties of finding or collecting data in this area, there are a number of preliminary statements that can be made to provide a sense of the situation:

- One of the earliest estimates (in the 1960s) in this area was that developing countries accounted for 2% of world R&D expenditure. An estimate was made for 1973 and gave the same ratio as being about 3%.
- Unesco data shown in the 1985 statistical yearbook suggest that developing countries accounted for 2.3% of R&D expenditure in 1970 and for as much as 6% in 1980. Similar data on numbers of R&D scientists show developing countries with 7.9% of the total in 1970 and 10.6% in 1980.
- There is a major imbalance between the proportion of worldwide research undertaken in the Third World and its share of world population (81%) or of combined world production (21%). The figures show that over the last 20 years there has been some small reduction in this imbalance; however, the developing countries, as a whole, continue to invest usually less than 0.5% of gross domestic product (GDP) in research activities, whereas the corresponding figure for the leading developed countries is 1.5–2%.
- More detailed estimates exist for agricultural research; however, even here there is a range. In 1979, one study estimated that 15% of global expenditure on agricultural research was spent in the

developing countries; another study completed shortly after suggested that one-quarter of global agricultural research was related to expenditures in the developing countries.

- Most studies indicate that, whatever the relative proportion of R&D expenditure in developing and developed countries, the absolute amounts spent in this field by developing countries have increased enormously in the last 20 years. In agriculture, a study covering the data for 67 developing countries estimated that, in 1980, expenditures on agricultural research at 1975 prices were in the order of $1082 million, 71% higher than the amount spent in 1975 and 170% higher than the level reached in 1970.

- There is enormous imbalance, even in the amount of money spent on R&D by the developing countries. A few major countries account for a very large percentage of overall expenditure, e.g., Argentina, Brazil, China, India, Mexico, and South Korea. Unesco figures on R&D scientists show that, of the number estimated to be working in the developing countries, 4% are in Africa, 8% in the Arab world, 23% in Latin America and the Caribbean, and 65% in Asia. (Corresponding figures for overall developing world population distribution are 11, 7, 11, and 71%, respectively.) One should also note, however, the imbalance between developed countries where, of the 24 OECD member countries, 88% of expenditures devoted to R&D in 1984 was taking place in 5 countries.

- If the 1960s and 1970s were characterized by rapid growth in absolute expenditure on R&D in developing countries, present circumstances would seem to suggest that the rate of growth is likely to slow and that increasing attention will have to be paid by developing-country governments to the question of increasing returns to the funds invested in research.

- The R&D industry in developing countries now accounts for about $16 billion/year and yet the broad parameters of this major activity remain largely underresearched and unknown. The equivalent figure for OECD countries is about $245 billion (1984) — a further indication of the striking global imbalance in this area of development investment.

Role of External Funding

Although national funding is by far the most important, it can be argued that there are compelling reasons for external agencies to provide a significant share of Official Development Assistance (ODA) to research. First, research is essentially a long-term activity. At the same time, countries that are faced, as many of the developing countries are, by urgent and pressing problems of poverty and macroeconomic imbalance, both in terms

In 1980, expenditures on agricultural research were 170% higher than the level reached in 1970.

of funding of public expenditure and in terms of balance of payments, must find it tempting to regard research as an expendable item in some short-term calculations.

Second, research is characterized by major externalities — most benefits of research in one part of the developing world may well accrue elsewhere and the decisions on research may well require a broad global or regional view of the opportunities and payoff for research on particular areas. Although this must be first and foremost the responsibility of national governments within a region, donor funds can also often be used to take account of these externalities. This is particularly important when a large number of countries with a population of less than 5–10 million is considered: it may be difficult to create the necessary critical mass for research on particular topics in some of these countries, even where the research problem should be given priority.

Third, research has an important requirement for foreign exchange in terms of equipment and advanced, specialized training outside the boundaries of the individual country.

Fourth, donor funding has played a major role in the development of a substantial set of multilateral research institutions in the Third World (and some in the industrial countries). This set was reviewed in the introductory section to *Searching* for 1985 — it was estimated that the research budget for those institutions could be as high as $550 million/year. They represent a growing and important new dimension to R&D in and for the Third World and account for a significant share of ODA funding to research. It is also worth noting, of course, that research carried out in the Third World is not only likely to contribute to Third World development but also, in some cases, to benefit the developed countries.

Donor funds are clearly making a major contribution to research on some topics in particular parts of the world. For example, a recent report on agricultural research in the Southern African countries belonging to the Southern African Development Coordination Committee (SADCC) showed that more than 50% of agricultural research being undertaken in those countries was externally funded. Where external funding is accounting for such a major proportion of current research, there must be adequate safeguards to ensure that national priorities are really being followed and, at the same time, that there is adequate provision for building research capacity for the future so that activity can be continued after external assistance ceases.

Amounts of External Aid

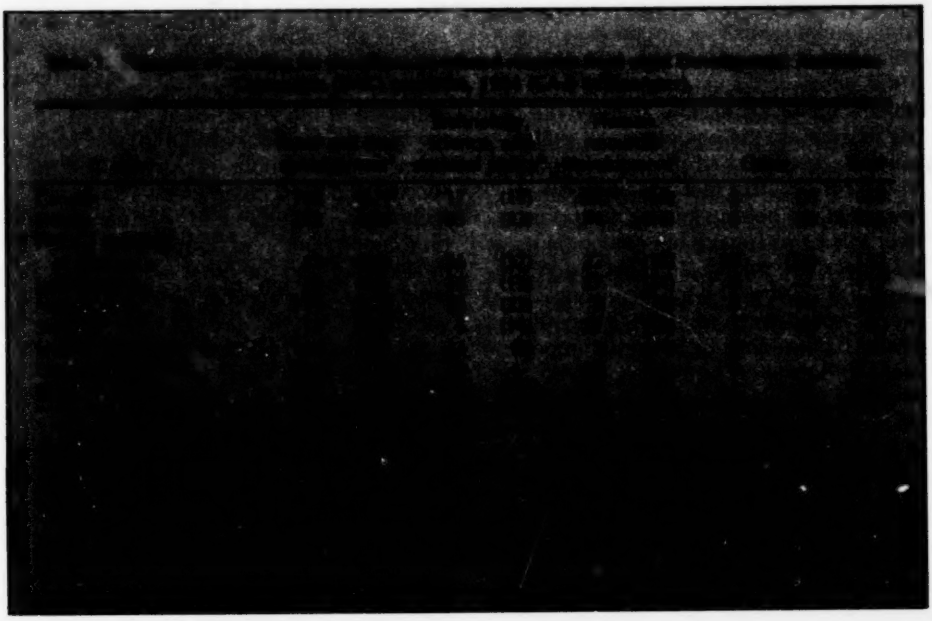
As an agency whose major role lies in supporting research for development in developing countries, IDRC is conscious of the value of knowing the broad contours of Third World R&D to ensure that its own activities are most effective. The improvement of input indicators on Third World R&D, however, is essentially a long-term task for national authorities, although it can obviously be assisted by outside agencies. As a first step in improving its knowledge of the environment in which it operates, IDRC determined to fund a study of support provided to Third World R&D by major funding agencies. This was undertaken by Professor John P. Lewis, and will be published later as a separate paper. A brief presentation of some of the survey's findings follows.

Professor Lewis encountered major difficulties in collecting information, by questionnaire and through visits, on a consistent and comparable basis; a considerable part of his report deals with these problems and suggests methods for donors to capture information on this set of activities more easily. As it is, there are still anomalies apparent in the data presented — probably in part because of responses of "agencies" capturing slightly

different sets of activities. It is hoped that the presentation of preliminary data will contribute to better information being available in the future.

The survey data cover eight DAC countries, the World Bank, the Asian and Inter-American Development Banks, and the United Nations Development Programme. The DAC countries covered accounted for some 82% of DAC's overall ODA in 1984 and so provide a fairly representative picture of DAC funding. According to OECD statistics, the same eight countries account for 63% of all world ODA. As a group, these eight appeared to be devoting some 4–5% of ODA resources to research for development. This overall percentage would be higher if it related only to direct flows to developing countries because, typically, some 30% of ODA is to multilateral agencies (e.g., agencies of the United Nations system and the aid branch of the European Economic Community [EEC]).

Individual countries' percentages of ODA devoted to research range from nearly 10% (Netherlands and United Kingdom) down to 3.1% for the USA. Table 1 shows the figures for the DAC countries concerned and also provides a rough sectoral breakdown. Table 2 shows similar figures for the four multilateral agencies. The overall current annual funding to development-related research that has been covered in the present survey is $1.9 billion. (It is worth noting at this juncture that Canada alone spends more than $6 billion/year on R&D as of 1985, which is more than triple the total R&D support flow to the Third World.) Currently, nearly $1.3 billion/year of external funds to R&D goes to research on rural and area development, which includes agricultural research. This compares with an estimate made for the 1976–80 period that the value of external resources for agricultural research in developing countries was running at a rate of $407 million/year (1975 prices). It should be remembered that the figures for the World Bank are incomplete and that the survey did not cover all donors (a number of foundations, e.g., Rockefeller and Ford, play an important role in



research funding and Australia also has a centre dedicated to supporting international agricultural research). With these omissions in mind, it may not be far off the mark to estimate that the current overall volume of aid to development-related research defined along lines comparable to the average usage of respondents to the survey is in the range of $2.1–2.2 billion/year.

Although data were requested for 1970, 1975, 1980, and 1984, it was extremely difficult to establish time series for the countries and agencies responding to the survey. For four countries where data were reported for both 1975/76 and 1984, there was a clear upward trend as a percentage of total ODA. In three out of the four cases, the percentage of ODA going to research had more than doubled in the period. This fact adds support to the generally held view that most donors, over this period, have been giving greater assistance to research and that the World Bank has been giving an increasing number of loans to research. When the World Bank reports in its annual report on loans to borrowers by major purpose, it refers to agricultural research (research does not figure as a separate category in sectors other than agriculture and rural development). In 1982–85, loans to agricultural research and extension by the World Bank were 3.6% of the total loans to agriculture and rural development — 2.5% of International Bank for Reconstruction and Development (IBRD) loans and 5.5% of International Development Association (IDA) loans. (IBRD and IDA are the two main lending arms of the World Bank.) To the extent that the IDA countries are the least wealthy, this would seem to go counter to the observation made elsewhere that the emphasis on poverty eradication in some aid programs has reduced the percentage of donor funds going to research.

The donors have given strong sectoral priority to research bearing on rural and area development, as can be seen from the tables. During the past 10 years or so, the allocations in this direction have claimed over half their research-supporting budgets, and the inclusion of the World Bank, at least on the basis of the data available here, only intensifies this emphasis. As between the second and third categories — technology, science, and national policy on the one hand and human resources development on the other — there has been something approaching parity, but with a tilt lately toward the former. The more interesting point that can be seen from these figures may be the extent to which particular agencies specialize in one or other of these two directions. Where data are available on sectoral preferences over time, it appears that, although all agencies have sustained a principal emphasis on rural and area development, for most of them, the technology and policy sector has been accounting for a growing proportion of

funding, whereas their inputs to human resources development have been declining relatively.

Within the broad categories for which information is shown in the tables, there are major concentrations worth noting. Within *rural and area development*, annual support to research on agricultural and rural development accounted for $1.1 billion or about 85% of total funding. The other topic attracting major research support was energy, which accounted for most of the outlays on the natural resources subsector. Energy research funding picked up after the first energy price shock in 1973/74. By 1984, for the 10 respondents where data are available from the survey, it accounted for $144 million or 11% of their *total* support to research.

Donors have been giving the other components of rural- and area-development research a light touch. Outlays on environmentally related research jumped in the latest reported year, but only to $5 million/year. Transport-related research claimed $3 million in 1970 (on the part of a smaller set of respondents) and less since. Relatively little appears to have been spent on studies of human settlements and related matters.

For the 11 respondents with data available on *technology, science, and national policy*, investment was most heavy in engineering and technology research and in research on industrial development. The former appears to have been on a rising trend, the latter on a declining one, but between them they claimed about three-quarters of the category's research budget in each of the last three benchmark years.

As to the balance of the technology, science, and national policy research budget, work on management, development planning, economic policy, and applied social sciences has attracted greater funding than work in the natural sciences. But both have received good support and obviously some of the activities classifed under "technology" have a good deal of natural-science content.

Of the four subcategories into which the survey divided funding of research on *human resources development*, education/training and health/nutrition claimed at least 80% of external support in the last three benchmark years. Work on education and training received two-thirds of this assistance, but the figures suggest that the receipts of the two subcategories are converging. In the way the data were collected, research into the subjects of income distribution, poverty, and employment seems to have been comparatively neglected, although they are shown as picking up some latter-day strength (oddly enough *after* donors' antipoverty and basic-needs efforts of the 1970s had peaked). As Professor Lewis points out, this is somewhat accidental and misleading. One knows, for example, from a good bit of World Bank and United States Agency for International Development (USAID) funded research into these subjects in the 1970s that the present survey misses because of the single-year nature of its information about those two respondents. Moreover, some income distribution-, poverty-, and employment-related research has been included in activities attributed to "agriculture and rural development." Nevertheless, the current investment in poverty and employment research looks rather sparse. The same, by the estimates of many, could be said of outlays on population-related research. Nevertheless, there seems to be a steady base of support for such activity.

Aid Effectiveness

The presentation of information here has emphasized the supply of resources to the research process, predominantly that provided by external funding to developing countries. The information on developing-country national investment in research is available in less detailed form;

the aggregate figures might lead one to think 10% of developing-country research activity is being externally funded.

A natural and compelling counterpart to the consideration of the input of resources to the research process is to examine the outcome or products of this research. This is an issue that clearly requires and deserves more space than will be devoted to it here, but the examination of input data would not be complete without acknowledgment of some major issues on the output side. In the case of IDRC, some investigation of these issues has been presented at greater length in a study published in 1986 (*With Our Own Hands: Research for Third World Development; Canada's Contribution through the International Development Research Centre 1970–1985* [IDRC-246e]).

The general question of aid effectiveness is a major area of inquiry at present. Its debate has been influenced by the Cassen report on aid effectiveness commissioned by the International Monetary Fund (IMF)/IBRD Task Force on Concessional Flows, recently published as a book, which has generated a number of studies, particularly in the last 2 years. To the extent that the Cassen report and the debate in general caution against trying to suggest that one can know the *precise* degree of the effectiveness of aid, they have lessons for the research area as well.

The overall supply of funds to development research has two major objectives: problem solving and capacity building. In other words, funding to research seeks to contribute to the process of finding solutions to urgent development problems, solutions that need to be available as soon as possible. It seeks also to contribute to building indigenous problem-solving capacity in the developing countries. Donors, as shown in their replies to the Lewis study, exhibit sharp differences on the weight they attach to the different functions. One donor says the purpose is to find solutions to development problems, as quickly and satisfactorily as possible — *who* does the

Most donors prefer to put emphasis on research-capacity building.

problem solving and *how* are secondary issues. Another donor insists its purpose is to build problem solving, i.e., research capacity, in the recipient country. A third says capacity building is the real objective; however, the best way to build capacity is to help the recipient learn by doing. It is this third way that is closest to the approach adopted by IDRC. Other donors choosing the same way, however, have put greater emphasis than IDRC on the provision of outside expertise to work with developing-country researchers. Professor Lewis has concluded that it is the latter two ways — those referring to research-capacity building — that most donors prefer.

This difference in donor practice illustrates one opportunity for working toward greater effectiveness in the use of donors' resources: consideration by the donors as a group of their present and future funding intentions with respect to sectors and practices. Some mechanisms exist already to ensure donor coordination in support of research, for example, informal meetings of donors to energy research and the Special Program for African Agricultural Research. There is also the basis for a more systematic exchange of information between donors — the Inter-agency Development Research Information System (IDRIS) was created jointly by a number of publicly funded agencies that have supporting research as a major part of their mandate and it is managed by IDRC. Other agencies have also expressed interest in the data base and are potential contributors.

The major consideration of effectiveness of aid to research, however, will depend on the general view of how well, overall, research is serving the process of development. Research can be treated as an economic activity; it requires scarce resources and it provides something of value, but it is the value of the new knowledge that is difficult to determine, even when one can show it is being used. In the productive sectors, particularly in agriculture, where research feeds into the process of production of a commodity that has a market value, studies of the rates of return to investment in research have been undertaken. The calculations involved are not without their complications and controversy; nevertheless, an increasing number of studies on the rate of return to investment on agricultural research in developing countries show high rates of return to the investments made. Indeed, they can be used to show that there has been marked underinvestment in this area, the marginal rate of return from investment to agricultural research being higher than that on many other development investments.

For some areas of research, however, the economic argument is not possible in such precise terms as a rate of return. In *With Our Own Hands*, IDRC has sought to show that research for development is making a difference to the way people live and work in the developing countries. The publication reports on a number of cases where IDRC had some role in supporting the research, but where the essential work of carrying out research and following it through to the point of its being beneficially used involved a multitude of agents and actors. Much research must be judged on this "micro-level" rather than in the "macro" aggregate calculations of rates of return.

It is these small pieces of the action that together make a difference and contribute to the well-being — or better-being — of developing-country populations. Several of these activities supported by IDRC are reported on in the subsequent sections of *Searching*.

Serving Third World Innovators

Too many pictures show the people of the developing countries in passive roles — children holding out their hands, refugees hoping for a new life, starving people begging for food. One could easily be led to think that millions have resigned from life and are leaving it to outsiders to solve their problems.

The first part of this 1986 edition of *Searching* should help lay to rest this stereotype of a Third World that relies on other people to feed it and think for it.

Although a large part of international aid does go to emergency relief, technology transfer, and technical assistance, an increasing portion is spent on original solutions to problems, many of them long term. Money given to support research tends, more and more, to go to institutions and scientists in the developing countries themselves, many of whom have already made important breakthroughs.

Two of the most heavily populated countries in the world, China and India, are now grain exporters. This is mainly because of the contributions made by Chinese and Indian researchers to the Green Revolution. Plant diseases and crop pests keep changing with the result that the sustained growth of agricultural production in several Asian countries has to be based on national agricultural research infrastructures. Most of the developing countries are gaining control of their food production. Indeed, in 1986, the traditional major grain exporters found it difficult to sell what they produced.

Scientists in the developing countries are beginning to make a name for themselves in a number of other areas such as sanitation, contraception, economics, education, and the treatment and processing of food. The following pages give numerous examples of results from Africa, Asia, Latin America, and the Caribbean.

IDRC's greatest contribution lies in its being the first international aid organization to make a systematic investment in the brain power of the Third World. What follows is not only a description of the innovative efforts supported by IDRC but also a demonstration of the intellectual energy of the inhabitants of the less-favoured parts of the world.

IDRC gives preference to projects conceived and executed by Third World scientists to increase the likelihood that the results will be of real benefit to the people of the developing countries. In the past 16 years, the Centre has approved the funding of almost 2900 such proposals. In doing this, IDRC constantly tries to support those scientific efforts most likely to improve the lives of the people that science and technology have forgotten.

In the area of agriculture, IDRC has championed "on-farm research" (done in collaboration with the peasants) and research on production systems for small-scale farmers. In the social sciences, there have been many action research and participatory research projects in which the people themselves are equal partners with the researchers. The Centre has constantly looked for ways to ensure that the research it funds meets basic needs: food, water, health, housing, and education.

Research for Life

In 1986, the Health Sciences Division made an innovative contribution

Improved varieties have contributed to make China and India net exporters of cereals in 1986.

to the attempt to link science to the actual improvement of the quality of life. Following its new strategy, the Division has taken steps to have communities establish their own priorities for research projects. Instead of being the passive recipients of research efforts by outside specialists, the people become the researchers' partners. A whole series of projects deliberately aimed at inventing new research methods has been proposed, all of them should make the projects supported by the Division even more responsive to genuine health needs.

Research on community health services, traditional healers, and health workers will not only provide information about their coverage and effectiveness, but will also attempt to show how a good relationship between the local population and health professionals can be achieved. The aim of the research supported by the Division will be to improve health services or improve the state of people's health directly.

The World Health Organization (WHO) set the year 2000 as the date by which "health for all" must be achieved. As that deadline approaches, the debate over medical program priorities intensifies. In Africa, for example, the strategy of providing primary health care is faltering. Some suggest that what few resources exist should be concentrated on water supplies, whereas others think the priority should be educating and mobilizing the people. Still others suggest that vaccines are the answer. Several of the projects the Division has funded are at the heart of this debate.

Mothers and Health

After a rapid fall in the 1950s and 1960s, infant mortality rates have stabilized in many developing countries at an unacceptably high level. A good many specialists no longer believe that technology alone can solve the problem. They believe that the main causes of high infant mortality are poverty and the parents', especially the mother's, lack of knowledge.

The argument over how significant a role technology plays is crucial to the improvement of health in the developing countries. After all, of what use are new vaccines if unsanitary housing and human ignorance result in pneumonia and diarrhea killing children who have been vaccinated against measles and whooping cough?

In Peru, one of the poorest countries in Latin America, IDRC's Health Sciences and Social Sciences divisions have jointly supported a multidisciplinary team at the Instituto Andino de Estudios en Población y Desarrollo in Lima. It is attempting to determine what socioeconomic factors are linked to the incidence of diarrhea, malnutrition, and respiratory diseases. The importance of research of this kind becomes readily apparent if one realizes that countries with the same technology

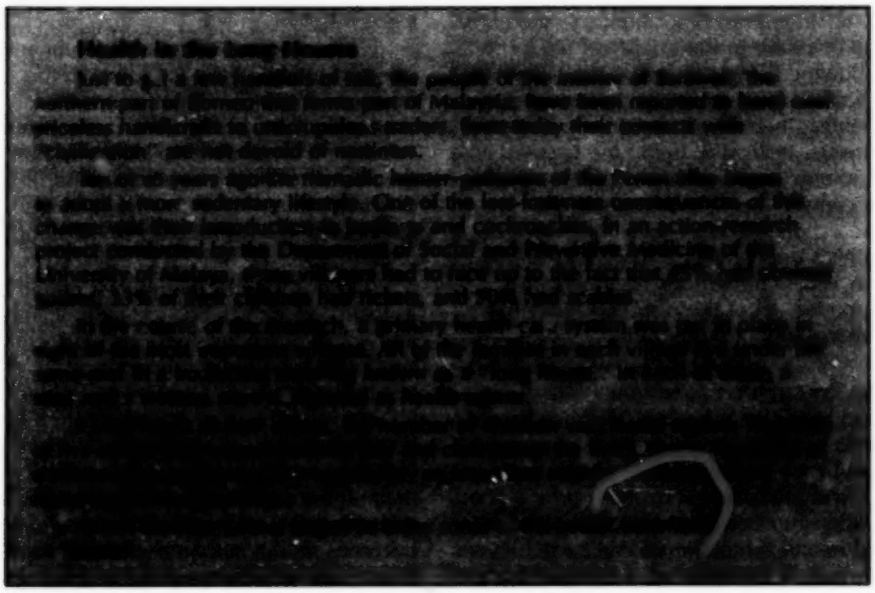
have greatly differing infant mortality rates.

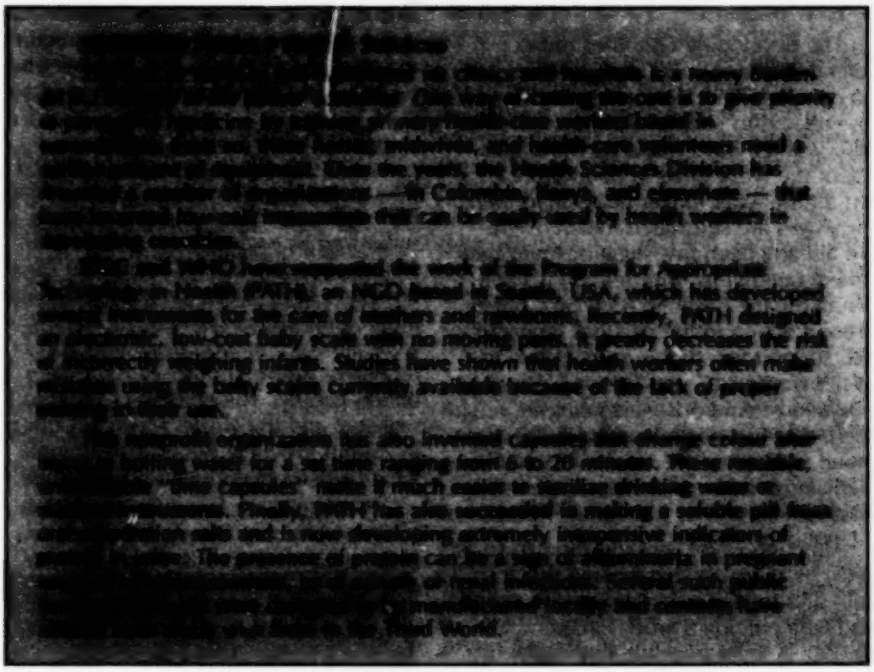
Along the same lines, the Health Sciences Division has decided to support research by three nongovernmental organizations (NGOs) in Argentina, Chile, and Uruguay. They will examine the strategies used by poor families whose children are healthier than average. The hypothesis is that it is the mothers who are mainly responsible for this difference. According to the researchers, well-informed and motivated mothers, have a decisive impact on the infant mortality rate. They hope that if they base health programs on educating mothers, there can be rapid results without having to wait for the general standard of living to improve.

The Temptation of Vaccination

The attractiveness of vaccines is still, however, undeniable. Vaccination wiped out smallpox and keeps a host of other diseases at bay. The year 1986 stands as a turning point in the development of new vaccines against tropical diseases. The first vaccine against malaria, a parasitic disease, has been tested on human beings. Research aimed at developing vaccines to combat other parasitic diseases has begun to break new ground. These diseases include leishmaniasis, which attacks the skin or internal organs, and schistosomiasis, which mainly affects the liver. Also, an experimental vaccine against leprosy has produced encouraging results.

WHO supports most of the research into these diseases, and the IDRC's Health Sciences Division has responded by increasing its support for WHO's research program on tropical diseases. This large-scale program unites specialists from around the world in the fight against filariases (parasitic diseases brought on by worms small enough to circulate in the blood) and trypanosomiasis (sleeping sickness), as well as the four diseases previously mentioned. The Division's program officers, however, have also allocated a substantial portion of the grants to Third World institutions. In 1983–84, half the research work supported by the program was done in developing countries. A number of institutions were





also directly supported by IDRC to conduct research into malaria, filariases, leishmaniasis, and dengue fever (a viral disease transmitted by mosquitoes).

Less attention has been paid to leishmaniasis than to the other parasitic diseases. In Colombia, Mexico, and Peru, however, researchers have been studying the incidence of its various forms. In the first phase of a project conducted by a team from the International Centre of Cooperative Medical Research (CIDEIM) in Cali, Colombia, it was demonstrated that the likelihood of infection is determined not only by work in the forests, as was hitherto supposed, but also by the season, the victim's age, and his or her housing. The Peruvian team will have the support of a specialist from the University of British Columbia, Vancouver, Canada, in a cooperative project. (Cooperative projects require collaboration between at least one Canadian institution and one developing-country institution, see the section on The Contribution of Canadian Researchers.)

Among the numerous efforts aimed at helping developing countries to become more active in the scientific and technological struggle against disease, the research done by the Instituto de Medicina Tropical "Pedro Kouri," Havana, Cuba, is of particular interest. Until recently, the hemorrhagic form of dengue fever (DHF) had never been seen outside Southeast Asia, but in 1981 there was an outbreak of it in Cuba. In a 6-month period there were 10 000 reported cases and 158 deaths. The Institute showed that the virus, transmitted by mosquitoes, was particularly likely to strike women and people with asthma or diabetes. Given the danger that the disease now poses, the Health Sciences Division is supporting research in Honduras and Mexico where there have also been some deaths caused by DHF.

New Diseases

The developing countries must contend with not only "old" diseases but also completely modern ones, such as those related to industrialization. Since 1980, women have made up more than 37% of the work force in South Korea. Even if they work longer hours than men, their wages are still much lower. There have already been investigations into their working conditions, but only on a small scale. Now the Catholic Medical College of Seoul, which in the past has received IDRC support for studies on coal miners and the workers of small- and medium-size enterprises, is going to undertake an in-depth study of 3000 women workers in the textile, shoemaking, rubber, and electronics industries.

Although Egypt isn't industrializing as rapidly as Korea, it is estimated that the small- and medium-size enterprises in the Nile Delta employ a work force of 540 000. A team from the University of Alexandria will draw up a scientific profile of the most frequent kinds of work accidents. In the Egyptian capital, Cairo, a number of enterprises have begun manufacturing pesticides, but their managers know almost nothing about the dangers involved. Specialists from the University of Cairo School of Medicine will inspect 10 of these firms to find out more about what is going on and to propose preventive programs for workers and employers.

It seems that even the relatively less-toxic synthetic pyrethroid insecticides (which are rather harmless to warm-blooded animals, including human beings, but very poisonous to cold-blooded animals, including insects) can be dangerous in certain situations. The Chinese Academy of Preventive Medicine in Beijing has asked IDRC to fund research into numerous poisonings that have occurred since 1980 when synthetic pyrethroids were introduced on a large scale in China. In 1982, 300 cases of pyrethroid poisoning were reported among cotton growers. The Chinese researchers want to identify the precise reasons for this situation, which seems to be unique to their country.

Action Research on Water

Diarrhea affects millions of people throughout the developing world. Some 750 million children under the age of 5 suffer from it each year in Africa, Latin America, and Asia. The figures for China, however, have only recently been made public outside the country. In 1983, there were almost 5 million reported cases of dysentery in this country of more than 1 billion people. The epidemics seem to be seasonal and the Ho-fei Medical College in An-hui Province hopes to determine what bacteria and viruses are involved.

A significant part of the Health Sciences Division's budget is spent on helping communities to clean up their environment. Here again it has joined the Social Sciences Division to fund a major action-research project directed by a scientist from the American University in Cairo. In this project, Egyptian academics will be the catalysts in helping village people, particularly women, to identify the sources of pollution and suggest solutions.

UNIMADE Pumps

If there is to be potable water available to 2 billion people by the year 2000, it will have to come from below the ground. In Cameroon, Costa Rica, and India, the Division will finance projects for the introduction of a polyvinyl chloride (PVC) pump that was developed in several previous projects.

The first model of this pump originated in Canada at the University of Waterloo. Teams in Africa and Asia then adapted it to their needs and local technological capabilities. Now the model that was perfected and mass produced in Malaysia, known as the UNIMADE, is enjoying great success. The three new grants will enable researchers to evaluate the potential of these plastic pumps in other countries and, for the first time, on

the American continent. IDRC water specialists expect that Costa Rica will become the centre for the dissemination of this technology throughout Latin America.

A project undertaken by the Ministry of Science and Technology of the Indian State of Rajasthan clearly shows the benefits of the plastic pump. There are already 50 000 water pumps in Rajasthan, but they are made of metal and corrode, giving the water a bad taste. Indian specialists, therefore, have decided to conduct a plastic pump trial. The UNIMADE pump is an especially attractive option because it can be maintained by the villagers.

Putting Research Results to Work

Each year more and more projects reach completion. For IDRC it becomes increasingly crucial to make sure that the research results are put to the fullest possible use. The skills and resources of the Communications Division are available to researchers who have produced results and want to disseminate them. The Division funds a few projects on its own but, more and more, is working directly with the Centre's program divisions. In 1986, for example, the Communications and Health Sciences divisions collaborated on two experiments in the dissemination of research results.

The UNIMADE plastic pump can be maintained by villagers.

In the first of these, Yayasan Kusuma Buana, an Indonesian NGO, will produce 26 radio dialogues on the care of mothers and infants. They are designed to popularize the results of research by four Indonesian teams that were supported by the Health Sciences Division to conduct studies of contraceptive practices, breast feeding, and the use of oral rehydration among the poor. The dialogues will be pretested and modified in response to the comments received. Once they have been initially broadcast — Kayu Manis, one of the most important radio stations in the Jakarta area, has expressed an interest — the programs will be offered to the 300 stations scattered over Indonesia, the largest archipelago in the world.

Again in Southeast Asia, but this time in the extreme northwest of Malaysia, the Communications Division has helped to alert the public to the threat from fecal matter. The project is an experiment done by the Consumers' Association of Penang, one of the most active and effective NGOs in the whole of Asia. They will disseminate leaflets written in simple, colloquial language describing the results of research into conditions in five villages. It is hoped that this will encourage communities to launch full-scale cleanup campaigns. Later on, the strategy developed will be offered to other NGOs in Asia that are involved in efforts to improve the health environment.

Most couples in the industrialized countries plan how many children they

want and when. This option ought to be available to Third World families too, but the cost of contraceptive methods must first come down. Since 1975, IDRC has supported research in India on a contraceptive vaccine. The work is now at an advanced stage. Indeed, in 1986, the National Institute of Immunology of New Delhi began tests on women in the United States and India. IDRC's support for the Indian researchers played a crucial role in enabling them to apply the most advanced endocrinology, immunology, and genetic engineering research techniques.

IDRC's Health Sciences Division has dozens of scientists as its partners — whether they are working on better water pumps, developing new vaccines, or investigating community health mechanisms jointly with the end users. The foregoing paragraphs mention only a few of the investigations the Division is currently supporting and provide only a brief glimpse of what is being done by the developing countries in medical and health research.

The Contribution of Canadian Researchers

The large majority of research projects financed by IDRC is designed and carried out by Third World scientists. They take charge of all phases of the research, from the original proposal to the final report, from the field studies to the management of the funds. IDRC is convinced that the best way to strengthen the scientific and technological potential of the Third World is to give its researchers opportunities to gain more experience.

There is, however, a great deal of knowledge available in the industrialized world that could be useful to the developing countries. For this reason, IDRC established, in 1981, its Cooperative Programs Division. Each of the Division's projects is jointly executed by at least one Canadian institution and one developing-country institution. The original proposal must come from a Third World institution that is seeking a Canadian partner.

The budget granted by the Government of Canada specifically for cooperative programs is divided into two roughly equal parts. One part is managed by IDRC's other divisions; the other is entirely controlled by the Cooperative Programs Division. These latter funds are used for projects in areas not usually covered by the Centre's other divisions. The Cooperative Programs Division currently has two programs: earth sciences and technology for local enterprises.

The Division's program officers are not simply trying to transfer Canadian technology to the Third World, their purpose is to finance genuine research projects in which Canadian and foreign partners jointly develop something new. What IDRC hopes to encourage is the transfer of knowledge, not the export of technological panaceas.

Saltwater Intrusion

In West Africa, as on other continents, many cities draw much of their water from the subsoil. Whenever the citizens of Dakar, the capital of Senegal, worry about their potable water supply, they are thinking of the aqueduct that brings water from Lake Guiers, 250 km north of the city. The truth is, however, that 83% of the water requirements of the Dakar region are met by drill holes and wells that tap six aquifers under Dakar and its neighbouring areas. About a third of the water comes from two aquifers right at the tip of the peninsula on which the city is built. That means that seawater is never very far away. If too much water is taken from the aquifers, there is a risk of intrusion by salt water and irremediable pollution of the water source. In the Geology Department at Laval University in Québec, engineers have developed a computerized model that will be applied to the aquifers, both of which have already been studied by

specialists at the Geology Department of the University of Dakar. The two universities will collaborate in the creation of computerized models for predicting the saline intrusion associated with various methods of water extraction.

Populations that depend on underground aquifers for their water need to be sure that such sources will be constantly recharged. What worries the hydrologists in the little kingdom of Swaziland, which has 600 000 people, is that deforestation favours a kind of erosion that interferes with the recharging of groundwater sources. The Ministry of Natural Resources has counted 2500 ravines, knowns as "dongas," some of them 10-m deep, which speed up runoff preventing the water from penetrating the soil. The Ministry's specialists will have the help of a Canadian company, Water Management Services of Fredericton, New Brunswick, in finding ways to prevent the formation of more dongas.

Domestic Fertilizers

The Cooperative Programs Division finances a large number of projects in which Canadian experts join their counterparts in Third World countries to develop mineral resources. Various projects are aimed at exploiting deposits of fertilizer-rich minerals without having to build expensive processing plants.

Burundi is located in the heart of Africa. It is a small, overpopulated country of 5 million people. It spends $2 million to import fertilizers every year. Recently, a substantial deposit of phosphates was discovered 70 km northeast of the capital, Bujumbura. Even allowing for export to neighbouring countries, it cannot be assumed that a typical phosphate fertilizer plant could be profitable. Part of the reason is that there is no local source of sulphuric acid, a chemical that is needed to process natural phosphates (in this case, mostly apatite) into soluble phosphates.

Scientists in Burundi, with the help of their opposite numbers in Zambia and at Agriculture Canada, will try to develop an artisanal process for the manufacture of fertilizers. They will replace the traditional method of sulphuric acid-based acidulation by partial acidulation in which the apatite is composted with dung, peat, or wastes from the harvest, wood, or slaughterhouses. Peasants in Burundi are already making compost using agricultural waste, and the country has enormous quantities of peat. If the results of the experiment are conclusive, in 3 years, the peasants of Burundi will be making their own phosphate fertilizers using their own resources.

Using Kilimanjaro to Build

The cost of building materials in Tanzania severely limits the access of underprivileged groups to decent housing. Sometimes, however, simply making the best use of what's available can solve the problem. Beneath the northeast slope of majestic Mount Kilimanjaro are 352 million t of building stone, the equivalent of 9 billion 15 × 25 × 50 cm blocks — quite enough to provide housing for the 500 000 inhabitants of the districts near Moshi and Rambo, which are among the most heavily populated in Tanzania. Using artisanal methods, about 150 miners are quarrying the stone, which is five times cheaper than cement blocks. They can't meet the demand, however; some weeks they don't even have enough dynamite and their output drops to 1500 linear metres of 15 × 25 cm bricks. The Prairie Masonry Research Institute of Canada in Edmonton, Alberta, and the Agricola Mineralia Company in Navan, Ontario, will collaborate with the engineers of the Tanzanian Ministry of Energy and Minerals to improve stonecutting techniques, build a number of prototype houses, and write a construction code for building in stone.

The 22 000 tin and tungsten miners in Thailand also work artisanally, using pickaxes and shovels in about 367 small open mines. Although tin has not escaped the general fall in raw materials prices, these small operations have suffered less than the largest Thai mining companies

because their operating costs are low. Thailand probably still has many small undiscovered veins of ore, too small for the large companies but large enough to be mined artisanally. So far, the discovery of ore veins has largely been a matter of luck. The Department of Mineral Resources in Bangkok has asked for IDRC support to work with the Institut de recherche en exploration minérale of Montréal, Quebec, to develop geochemical prospecting technology specifically adapted to conditions in Thailand. This technology will promote the continued operation of the artisanal mines, which employ thousands of people.

A Useful Bug

The Cooperative Programs Division also receives a steadily increasing number of requests to support research aimed at meeting the needs of the small- and medium-size enterprises in developing countries. In 1986, the Division responded favourably to a number of proposals, including one from the Instituto de Investigación Technológica Industrial y de Normas Téchnicas (ITINTEC) of Peru, which contacted the Metallurgical Engineering Department of Queen's University in Kingston, Ontario.

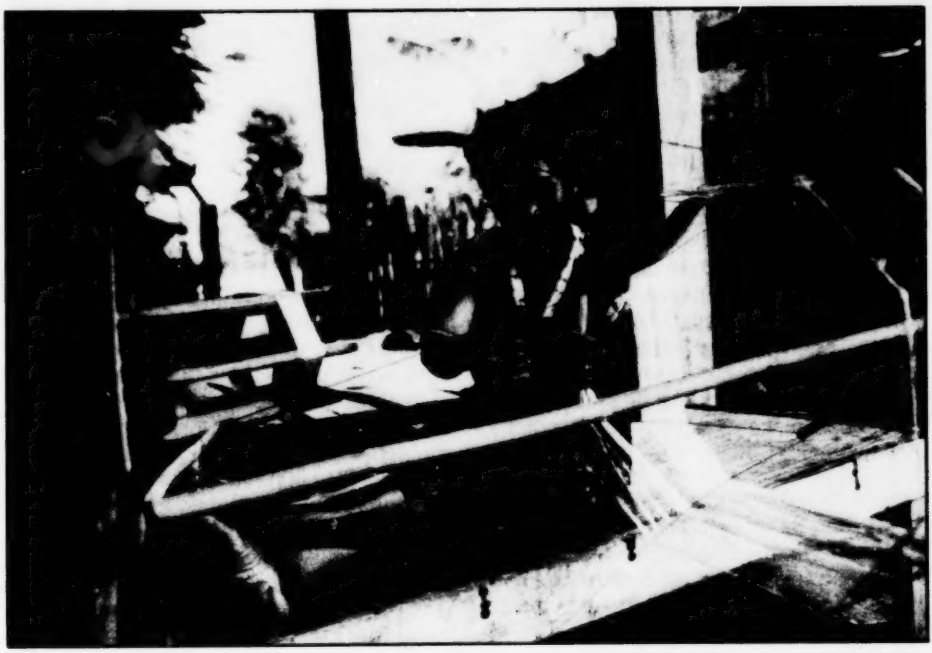
Metallurgists at the two institutions will tackle the problem of poor-quality brass (copper, zinc, and tin alloy) and bronze (copper and tin alloy) castings. Almost half the castings have to be melted down again and recast. Sand grains in the moulds and air bubbles greatly reduce the market share that alloys from the roughly 200 small foundries in Peru ought to be able to command. By sharing their latest discoveries with ITINTEC's researchers, the Canadian scientists will reinvigorate metallurgical research in this important mining country. Despite its mineral wealth, Peru currently imports $2 million worth of copper alloys every year.

In another joint project with ITINTEC, chemists at Simon Fraser University in British Columbia will study methods of extracting carmine from the cochineal insect *Dactylopius coccus*, which is a parasite found on cactus. Carmine is a bright red colorant used in dyeing, confectionery, and perfume manufacture. Because it is a natural colorant, strong demand has pushed the price of carmine to US $460/kg. Peru, unfortunately, mainly exports uncrushed cochineal insects (80% of world production) at the much lower price of US $35/kg. The researchers will try to develop efficient, small-scale extraction methods. If they are successful, a larger part of the industry's income will go to the 50 000 people who raise cochineal insects in the huge cactus fields of the arid regions of the Peruvian Andes. The Cooperative Programs Division is attempting to do something similar in India by making technology available to small- and medium-size enterprises for the extraction of sebacic acid from seeds of the castor-oil plant. Sebacic acid serves as a plasticizer for food wrappers.

Competitive Textiles

In many countries, small- and medium-size enterprises are particularly drawn to the textile industry. Industry activities range from family weaving to ultramodern, computer-controlled machines and constitute a microcosm of the history of technology. Innovations in weaving technology have an enormous impact because the industry is so wide spread and employs so many people. Now that the industrialized countries are robotizing the industry as rapidly as they can, the developing countries are confronted by the challenge of maintaining and developing a competitive, modern textile industry without losing too many jobs.

In Pakistan, 100 000 artisanal weavers work about 150 000 mechanical looms, most of which are locally made. Such looms produce a limited range of patterns and, in the long run, this is a threat to the attractiveness of Pakistan's textiles. The Pakistan Council of Scientific and Industrial Research in Karachi has asked for the technical support of the



Developing countries must modernize their textile industry without eliminating jobs.

Industrial Technology Centre of Winnipeg, Manitoba, to test a low-cost mechanical device to increase the number of patterns that can be produced. IDRC has agreed to finance this research. More than any other cooperative project, this joint effort by Pakistani and Canadian researchers displays IDRC's firm intention of promoting constructive scientific cooperation with the less-privileged nations of the Third World.

Keeping Scientists in Touch

Scientists need information just as much as they need grants. If they lack information, their efforts may be wasted because someone else somewhere else has already done the same experiments. Unless confirmed by other researchers, their discoveries are nothing more than opinions. Also, interaction between scientists is often highly productive; many important scientific contributions have come from the synergy of several researchers.

From the beginning, IDRC recognized the importance of information and established an Information Sciences Division. Over the years, the Division has made a contribution of capital importance by setting up international scientific information systems designed to serve first and foremost those researchers working for the benefit of the Third World. The Division has also given its support to a large number of documentation centres and libraries. IDRC support has also enabled national information systems to link up with major international networks, particularly in agriculture.

The Agricultural Bibliography Club

In West Africa, the Information Sciences Division has undertaken to help two more countries link up with the International Information System for Agricultural Sciences Technology (AGRIS).

The Division's contribution will help to reinforce the infrastructures of the Centre national de documentation agricole, in Burkina Faso, and the Centre de documentation in Senegal's ministry of rural development. These centres will be better equipped to collect national agricultural documents, catalogue them, and publish bibliographies. Although the information will be aimed at local users — decision-makers, agricultural engineers, teachers, and students — it will also be available worldwide through AGRIS, a network that offers access to the agricultural bibliographies of 116 member states. When a state joins, it is required to make its national bibliography available.

AGRIS Welcomes China

When the only country in the world with more than 1 billion people, 90% of whom are involved in agriculture, decides to join the AGRIS network, there is the threat of a major documentation bottleneck. On the one hand, there is AGRIS, which lists more than a million documents; on the other hand, China has thousands of documents all written in Chinese characters.

The Chinese authorities have decided to translate 65% of their agriculture-related bibliographic documentation into English before entering it in AGRIS. A grant from the Information Sciences Division will contribute to the translation of 80 000 AGRIS bibliographical records into Chinese and of 8000 from Chinese into English. Several Asian countries, including Malaysia, the Philippines, Singapore, and Thailand, have already been linked with AGRIS through IDRC support and have been waiting for a long time for access to Chinese agricultural research.

The essential tool in this project is MINISIS, a bibliographic software package developed by IDRC. This exceptional program, used by some 170 institutions worldwide, can operate in several languages at the same time. A unilingual Chinese would be able to find documents entered in the system in English only. The system will be the seventh MINISIS installation in China.

Information on Animals

It sometimes happens that the documents of an entire library disappear or become inaccessible because of wars or political upheavals. There are several cases in Africa where countries have had to recover the main elements of their national collection from other countries. In 1976, the International Livestock Centre for Africa (ILCA) in Addis Ababa, Ethiopia, began systematically collecting animal research documents from 21 African countries, thus avoiding such problems. Since that time, the Information Sciences Division has supported the collection that now numbers more than 20 000 documents. In 1986, it undertook to continue its financial support for another 3 years.

Other agriculture-related activities supported by the Division include two information services at the International Center for Agricultural Research in the Dry Areas (ICARDA) in Aleppo, Syria, which deal with beans (*Vicia faba*) and lentils. In regard to information on lentils, ICARDA will collaborate with the Crop Development Centre at the University of Saskatchewan, which houses the second most important group of lentil specialists after ICARDA. (Canada is the world's second largest lentil exporter.) A bulletin will be published on each of these legumes and will contain articles in both Arabic and English. In the Middle East, there has been intensive research into beans and lentils because they contribute much of the protein in the diet of the underprivileged.

Talking Technology

In Southeast Asia, the Information Sciences Division has successfully supported an important technical and industrial extension network called TECHNONET. The African countries have entrusted this mission of promoting appropriate technology to the Centre

régional africain de technologie (CRAT) in Dakar. The Division has agreed to support the development of CRAT's documentation centre by equipping it with a microcomputer and contributing to the training of personnel to run a question-and-answer service. CRAT will also be able to continue publishing its bulletin and newletter. Specialists will evaluate the usefulness of on-line access to data bases at the Centre in Dakar.

The Information Sciences and Social Sciences divisions of IDRC have also joined with other donors in Sweden and the United States in supporting the Council for the Development of Economic and Social Research in Africa (CODESRIA) in Dakar. CODESRIA funds research in the social sciences throughout Africa and has contributed to the establishment of social sciences research centres in Southern and East Africa. For about 10 years, CODESRIA has regularly published the quarterly *Africa Development*, in which articles appear in their original language: English or French. From now on, there will be a separate publication for each language and articles will be available simultaneously in both languages. It is expected that there will be a considerable expansion of CODESRIA's research activities and its influence in Africa.

Marketing

To date, the Information Sciences Division's grants have been aimed primarily at promoting the exchange of information between scientists. In the future, some of the projects will be directed toward other kinds of users.

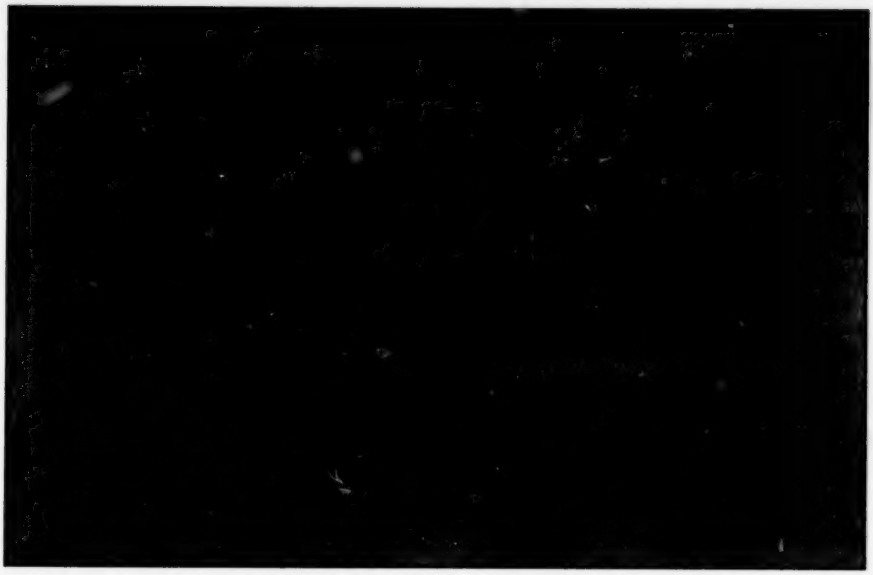
In Trinidad and Tobago, the Association for Caribbean Transformation (ACT) has inaugurated an information service on the market prices of 40 agricultural products. The aim of the project is to inform the 40 000 farmers of Antigua, Dominica, and Trinidad and Tobago of the prices they should get and the potential markets for their products. ACT bulletins, published quarterly in Antigua and monthly in the other countries, record price fluctuations and indicate market trends for the coming 2 months. By clearly describing the situation in each island, these bulletins provide small-scale farmers with extremely useful information. It is, in fact, so useful that radio stations in Antigua and Dominica broadcast it.

Another project should prove extremely valuable to numerous Caribbean and Latin American countries suffering from profound socioeconomic upheaval. Several countries have seen drops in personal income and find their future mortgaged by enormous debts. It is not surprising then to see increasing interest throughout the region in the exchange of information about the various economic strategies being adopted. IDRC has undertaken to continue its support for INFOPLAN, the Latin American planning information system designed to meet the information needs of planners. Another grant will help to set up a national documentation centre to serve as the focal point for INFOPLAN on the island of Dominica in the Lesser Antilles.

The Division will also provide support for a network that provides information about investment opportunities in the Caribbean and Latin American countries. RIALIDE (Red de Información de la Asociación Latinoamericana de Instituciones Financieras de Desarrollo), based in Lima, Peru, helps small- and medium-size entrepreneurs to get in touch with potential investors, development banks, or international banks. Bimonthly or quarterly bulletins on projects in need of funds — and on funds in need of projects — are RIALIDE's contribution to the region's attempts at economic recovery.

The Healers Speak

Cameroon is one of the few African countries that has reached self-sufficiency in food and is now giving priority to health. The strategy proposed by the government is designed to draw both on modern technology and on the skills of traditional healers. The government has,



among other things, provided the Institut de recherches médicales et d'études des plantes médicinales (IMPM) with new premises. A grant from the Health Sciences Division will help IMPM to manage and disseminate the information it gathers. Its 48 researchers annually produce about 200 publications and are among the most productive in West Africa.

Unfortunately, traditional healers are powerless to deal with poisoning caused by modern products. In Sri Lanka from 1979 to 1982, almost 80 000 people were hospitalized because of poisoning. Pesticides were involved in 65% of the cases, and it is expected that the number of cases will continue to increase. In response, the General Hospital in Colombo intends to set up a national poison information service with the help of a joint grant from the Information Sciences and the Health Sciences divisions. Information on antidotes and treatments will be available by telephone 24 hours a day. The service will also publish bulletins on how to handle the commonest forms of poisoning.

In rapidly industrializing countries such as Thailand, which now has more than 120 000 industrial firms, there has been an accompanying increase in work-related accidents. The inspectors of the National Institute for the Improvement of Working Conditions and the Environment (NICE) in Bangkok do the best they can. In 1984, they inspected more than 40 000 operations and offered advice to more than half of them. One of the priorities now is to analyze the mass of information and statistics that has been collected and to start up safety campaigns. In a cooperative project, NICE will have support from the Canadian Centre for Occupational Health and Safety in Hamilton, Ontario, in installing a data-processing system that runs on a minicomputer and MINISIS software.

Information on Water Supply

During the past year, the Information Sciences Division also agreed to finance several experiments on the collection and dissemination of information on water supply and sanitation in Argentina, Burkina Faso, the Philippines, and Sri

Lanka. In the Philippines, the Division will give its support to Aprotech, a regional organization grouping 38 NGOs in eight countries. In turn, these NGOs maintain exchanges with hundreds of other NGOs, a number of which have been spectacularly successful in helping to improve rural sanitary conditions. The Aprotech network will enable them to share their successes.

Portable Libraries

While information-exchange networks continue to grow, new storage methods are becoming available to users. Videodiscs and compact discs, for example, can carry an entire encyclopedia. Coupled with a microcomputer and a printer, videodiscs will make it possible to "take out" not a single book at a time but the whole library. By providing inexpensive ways to access the information on such discs, it may eventually be possible for developing countries to operate large numbers of these new-style libraries.

The Division has undertaken to support an experiment in the use of videodiscs by the Consultative Group on International Agricultural Research (CGIAR). This organization groups together, among others, the major international centres of research on rice (located in the Philippines), on sorghum and millet (India), and on corn and wheat (Mexico). About 5000 documents dealing with the most important crops in the Third World will be prepared for storage on videodisc.

Finally, a cooperative project of the Information Sciences Division links the Centre d'applications et de recherches en télédétection at Sherbrooke University, in the province of Quebec, with the Centro de Estudios Urbanos y Regionales de la Universidad Católica Madre y Maestra in the Dominican Republic. The researchers will develop a method of analyzing satellite photographs. The Dominican Republic occupies two-thirds of an island it shares with Haiti. So far, the forests of the Dominican Republic have survived better than those in Haiti. Increasing numbers of peasants, however, are migrating into the mountainous areas and the rate of deforestation is accelerating. Using satellite photos collected over a period of years, a multidisciplinary Dominican and Canadian team will analyze the environmental impact of successive laws governing agricultural land tenure.

In this way, aerial photos will serve as a reminder of the importance of the rural poor. In numerous Third World countries, the erosion of the mountainsides is the sign of desperate settlement by families who have nowhere else to go but do not have the resources to build the structures required to control erosion. IDRC's Information Sciences Division is contributing to make space-age technology transmit the plea of neglected, marginal people to planners.

Research for Nourishment

In recent years, food production in the developing world has risen twice as fast as population. The World Bank points out, however, that most of the increase comes from irrigated land, particularly in Asia. In most of Africa, agriculture is not only faltering but also destroying the environment. Very little land is irrigated, and marginal areas such as mountainsides are becoming overpopulated and overexploited by poor farmers. Even in regions where agricultural research has led to the development of highly efficient production systems, a great deal still remains to be done. Among others, for example, what can be done to ensure that the food sector acts as the engine of development by creating employment in rural areas?

The Agriculture, Food and Nutrition Sciences Division of IDRC supports research that might provide answers to such questions. The Division has also committed a good deal of its resources to

research on improving agricultural yields in the most difficult environments.

Women Entrepreneurs

Millet and sorghum account for about one-fifth of all cereals produced in the Indian state of Andhra Pradesh. They are consumed by the poorest families whose standard of living is far below that of people who eat wheat or rice.

During previous research done with IDRC support, nutritionists at the College of Home Science of Andhra Pradesh Agricultural University (APAU) in Hyderabad carried out a number of surveys in rural households. These showed the need to liberate women from the burden of threshing and grinding grain. The APAU team then developed food products for children using millet and sorghum dehulled by a machine developed in other IDRC projects. Other products made with millet and sorghum flour, such as biscuits, bread, and pastry, were also in great demand.

This led the Division to increase considerably its support for APAU and to help them to set up a number of small mills and bakeries. The management of the pilot mills and bakeries was given to women. The team from APAU, consisting entirely of women, expects these undertakings to create many jobs for women in poor rural areas. In the long run, it may be possible to modernize a major part of the food-processing sector and entrust it to rural women.

Insects Versus Insects

In Africa, cassava is the preferred food of the poorest populations. It can grow in poor soil and produces a large quantity of edible roots. It serves as a kind of insurance against famine because, even when mature, the tubers can be left in the soil for almost a year without spoiling.

Teams in Uganda, Rwanda, and Zanzibar that are working to improve cassava will have help from the Nairobi Station (in Kenya) of the Commonwealth Institute of Biological Control (CIBC) in a large-scale project to fight the enemies of cassava by biological means. At the moment, a number of insects of South American origin are threatening cassava. Mites were accidentally introduced into Uganda in 1970 and a type of mealybug that attacks cassava (*Phenacoccus manihoti*) was discovered in Zaire 3 years later. Those who grow this tuber simply

can't afford to buy insecticides. That is the reason for the great interest in fighting these insects by introducing others to prey on them.

Given the enormous diversity of Africa, a whole range of predators has to be identified, each one suitable for a different ecological environment. CIBC will use IDRC funds to train teams in nine countries in East and Southern Africa in biological pest control methods.

Protecting China's Crops

Chinese peasants are already using trichogramma, an insect that destroys corn and sugarcane borers by laying its eggs in their larvae. The national biological pest control program using trichogramma already covers 600 000 ha in China. Through a cooperative project, researchers at the biological pest control laboratory in Beijing will collaborate with those at Guelph University (Canada) in finding trichogramma that are effective against the enemies of other crops.

So far, the Chinese successes all derive from strictly empirical methods. Between 75 000 and 150 000 trichogramma/ha are needed to succeed with a biological control program. An understanding of the basic principles of mass breeding useful insects is needed, especially if the Chinese method is to be disseminated among farmers in other Asian countries. The international community of specialists in biological pest control, including its Canadian members, will gain a great deal from this collaborative project, which will include the production of an English translation of the Chinese manual on trichogramma.

Multidisciplinary Teams

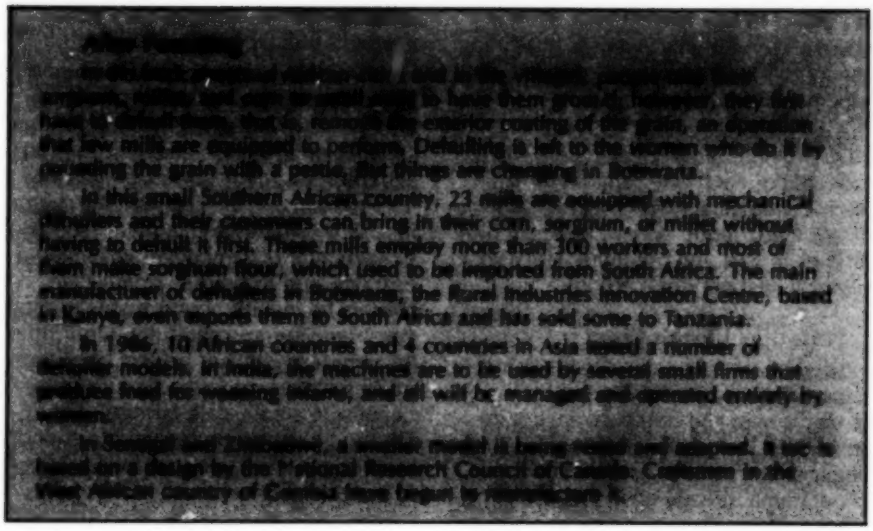
To help research teams that are trying to develop new integrated technology packages for farmers, the Agriculture, Food and Nutrition Sciences Division finances numerous projects on complete agricultural production systems or on crop or animal production systems. Several African countries are beginning to establish the multidisciplinary teams needed for such projects.

The Department of Research and Specialist Services (DR&SS) of Zimbabwe's Ministry of Agriculture has set up a unit to undertake research on agricultural systems. The Division will help the unit to develop systems suitable for use by small-scale farmers. The Government of Zimbabwe has made a firm decision to help its small-scale farmers financially, but it wants to move constructively and carefully. Until now, on-farm research has helped large farms in Zimbabwe; now it is time to bring the benefits to small-scale farmers. The Division has also undertaken to support another project to be executed by Sokoine University of Agriculture in Tanzania, which involves close collaboration with the local farmers.

Animals Great and Small

The Agriculture, Food and Nutrition Sciences Division also sets up networks of projects as a way to encourage exchanges. One of the most important created by the Division is the research network on animal production systems in Latin America. Supported for the last 8 years by the Division, it groups 13 projects whose work ranges from the improvement of pastures for dairy cattle, to the improvement of native breeds of swine, to the breeding of guinea pigs.

An important project approved in 1986 will strengthen the links between three Latin American organizations: the Inter-American Institute for Cooperation on Agriculture (IICA) and the Tropical Agricultural Research and Training Centre (CATIE), both in Costa Rica, and the Instituto Nacional de Investigaciones y Promoción Agropecuaria in Peru. In Peru, the Division will support research into alpaca breeding and guinea pigs. Guinea pigs provide meat for the people of the Andes Mountains and alpacas produce wool that can fetch $6/kg. The Peruvian veterinary researchers will attempt to increase the fertility of these two species.



Combating Aflatoxin

The storage of grain in the tropics poses some serious problems. Humidity and heat combine to produce mould, which, in turn, produces aflatoxin, an extremely poisonous and carcinogenic substance. The National Post-Harvest Institute for Research and Extension (NAPHIRE) in the Philippines will try to find low-cost methods for the protection of corn stocks against aflatoxin-producing mould. This research is likely to be of great value to small-scale farmers in the Philippines, who often have their grain rejected by mills because of mould.

In Zimbabwe, most of the loss of corn in silos is caused by insects. Farmers traditionally build their silos of wood, but the disappearance of the forests has made it increasingly difficult to build and maintain such storage facilities. An NGO called Environment, Development, Activities-Zimbabwe (ENDA) has already tested a new inexpensive brick silo in 11 villages. With the support of the Agriculture, Food and Nutrition Sciences Division, ENDA will perfect its silo and identify the conditions required for large-scale dissemination.

Trees for the Heights

One-quarter of Colombia is mountainous, and the healthy environment of the highlands has always served as a magnet to the population. Above an altitude of 2800 m, however, there has never been any systematic attempt to use the land. For a long time, foresters thought nothing of value could be grown there. Specialists at the Corporación Nacional de Investigación y Fomento Forestal in Bogotá, however, persevered and believed that certain trees could be acclimatized. The Division has agreed to support them in an effort to demonstrate that strains of eucalyptus and pine could be grown on 3.5 million ha of mountain slopes never before utilized. The results of this work are of the greatest importance to millions of peasant families who eke out an existence by cultivating the steep slopes of the Andes. This project is 1 of about 10 dealing with reforestation in the Andes. To encourage exchanges between researchers, the Division will pay the salary of a specialist from the Instituto Forestal in Santiago, Chile, who will be the liaison between the various teams. IDRC has acquired unique

experience in financing project networks and has witnessed genuine synergistic effects when mechanisms are put in place to encourage exchanges.

Trees for Profit

Several of the Andean countries control huge areas of the Amazon Basin. Because the Peruvian Amazon lowlands are a rather unhealthy environment in which to live, they have only very recently been settled. About 6.5 million ha of tropical forest have been cleared, but only a fifth of this area is actually under cultivation or in use as pasture. This is because the settlers abandon their land once its fertility is exhausted; 10 or 20 years later they burn off the trees that have grown back. The ashes of burned trees are the only fertilizer these "nomadic" farmers can afford.

IDRC has agreed to finance a cooperative project between the Universidad Nacional Agraria la Molina in Lima, Peru, and the University of Toronto, Canada, which will assess the potential of the tree and shrub species that grow up during the long fallow periods. Peruvian researchers have found that cecropia can be used in paper making, ochroma in the manufacture of insulating material, and guazuma in the manufacture of plywood. The commercial exploitation of many other species, which grow back naturally on abandoned clearings, would generate more wealth than the simple use of their ash. Two million settler families could end up profiting.

In Zambia, north of the Kalahari Desert, there are natural forests in which teak predominates. The forestlands block the advance of the desert and supply jobs, wood, and medication for the local population as well as forage for animals. Everyone agrees that these forests are important. Now, for the first time, there will be a study of the ecosystem of the teak forests. It will be done by the Forest Research Division of the Ministry of Lands and Natural Resources in Lusaka with support from IDRC. More specifically, the scientists will learn how to preserve forests instead of having to regrow them from scratch.

An Invasive Fish

In Africa, except in a few cases, fish farming has not been successful. Artisanal fishing in lakes or on the ocean accounts for almost the whole catch. The demand for fish, however, grows constantly. In the 1950s and 1960s, a large carnivorous fish, the Nile perch (*Lates niloticus*), was introduced into several East African lakes. The hope was that it would eliminate smaller, less-valuable species. *Lates niloticus* adapted so well that it now represents half the volume of the Ugandan fishery's catch. A controversy has arisen over the introduction of such a foreign species. Some say that the total catch will start to decrease because, in the end, the predators will overtake the native species on which they feed. Experts at the Uganda Freshwater Fisheries Research Organization hope to settle the controversy with research supported by the Agriculture, Food and Nutrition Sciences Division.

Some 1500 km to the south, in Malawi, the fisheries department of the Ministry of Forestry and Natural Resources hopes to guard against unpleasant surprises. The country has 300 small-scale fish farmers whose ponds range in size from 0.05 to 0.06 ha. The department is planning to make available to them an African version of the famous Chinese fish-farming system in which several species are raised together in the same pond. Malawi has a wide variety of fish species, and researchers hope to find local species of tilapia and carp that can be raised together to the profit of the country's fish farmers.

Aquaculture also includes shellfish raising and even the cultivation of marine grasses. In Gambia, West Africa, the fisheries department of the Ministry of Water Resources and the Environment, in Banjul, will introduce a system for

growing oysters on trays. IDRC-supported researchers in Sierra Leone and in Southeast Asia have already demonstrated that fixed, submerged trays are both efficient and inexpensive for oyster breeding. In Gambia, there are numerous tourist hotels that will guarantee a good market for oysters. IDRC has also undertaken to finance research into breeding scallops in Peru. Exporting them would guarantee a livelihood for coastal fishing families who have witnessed the collapse of the anchovy industry.

Finally, in Southeast Asia, the Agriculture, Food and Nutrition Sciences Division has financed a series of fish-farming research projects involving important species: milkfish in the Philippines and tilapia and carp in Thailand. Thai researchers will receive a grant from the Division as part of a series of projects ranging from investigations into the use of marine grasses as fish feed to state-of-the-art research into the genetic improvement of carp and tilapia.

Agricultural Software

Most of the researchers supported by the Agriculture, Food and Nutrition Sciences Division are working on biological or technical problems. In effect, they are concerned with physical material such as plants and soil — agricultural "hardware" so to speak. The Division now also supports work on agricultural "software," that is to say, the economics of new technologies.

In Sri Lanka, for example, the Division has agreed to support research at the Institute of Post-Harvest Technology to determine whether a market exists for the fish caught by shrimp boats. By-catches of this kind have an overall potential of 90 000 t/year; however, will consumers want them and, if so, under what conditions?

Also of concern to the whole Division is the important question of which factors determine the adoption of new technologies. In the Philippines, agricultural extension workers have praised the value of leucaena in preventing erosion. What convinced some of the peasants to plant these trees on their mountainside lots? Why have some fish farmers decided to adopt new methods of producing fish fry in captivity given that they have traditionally caught them in the sea? What is it about the technologies that attracted them?

It has been said that good technology sells itself. It seems as though profitability is the primordial criterion, particularly if the innovation is aimed at low-income people.

The director of the socioeconomic research division of the Philippine Council for Agriculture and Resources Research and Development (PCARRD) at Los Baños will coordinate teams from six universities that will study the reaction of potential users to some 40 new technologies. The researchers hope to identify the determining factors in the adoption of new varieties of fruit and vegetables and new methods of growing coffee, cacao, and rice, and breeding methods for milkfish and shrimp. By allotting increasing importance to economic studies, the Agriculture, Food and Nutrition Sciences Division hopes to ensure that the research it sponsors will be genuinely useful and accessible to small-scale farmers and other end users.

Assisting Decision-Makers

Which demographic policies should be adopted to limit pressure on available resources? What kind of education will guarantee the poorest schoolchildren jobs in the future? How are jobs to be created in the countryside and in the cities? How can small-scale farmers be guaranteed a decent income? How can the foreign debt be paid back at the same time as investments necessary to job creation are made? In essence, how does one build and manage a country?

Designing National Policies

What follows gives no precise answers to these questions. It serves

simply to illustrate how IDRC's Social Sciences Division supports the research and thinking of economists, demographers, educators, and planners in the Third World who are trying to find original solutions to these problems.

The Division makes its resources available to some of the most innovative minds in Africa, Latin America, and Asia. Compared with the efforts of the countries themselves, its contribution is minimal. IDRC support, however, has been decisive in helping a number of research groups to survive difficult times — research groups that later went on to design and implement important national policies.

The Cruzado Plan

On 28 February 1986, the Brazilian government inaugurated its Cruzado Plan. To stop inflation that was approaching 1000% per year, Brazil instituted a new currency, the Cruzado (replacing the Cruzeiro). It also fixed the currency's rate of exchange in relation to the U.S. dollar and froze prices and wages.

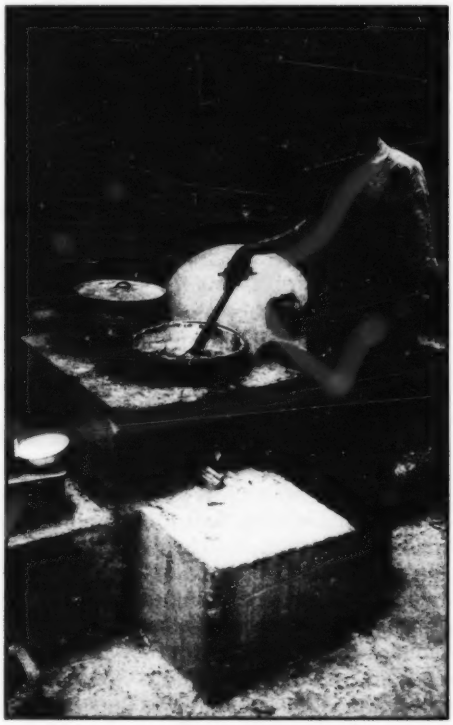
In adopting this extraordinary and dramatic course of action, the Brazilian authorities took many of their ideas from the work of economists at the Pontificia Universidade Católica, Rio de Janeiro. Since 1983, these economists have been working, with IDRC's support, on a computerized model of the Brazilian economy. In the end, this model enabled Brazilian decision-makers to simulate how the national economy would behave depending upon the strategy adopted. The model convinced them that a major devaluation would result in a comparable increase in production costs and further stimulate inflation. This led them to the Cruzado Plan, which represents a break with policies generally recommended by the IMF, namely devaluation, higher interest rates, and restrictions on internal demand.

Observers from around the world are keeping a close watch on the application of the Cruzado Plan. In its first phase, it has managed to break the inflationary spiral. In 1986, IDRC decided to continue giving support to the researchers at the Pontificia Universidade Católica, Rio de Janeiro.

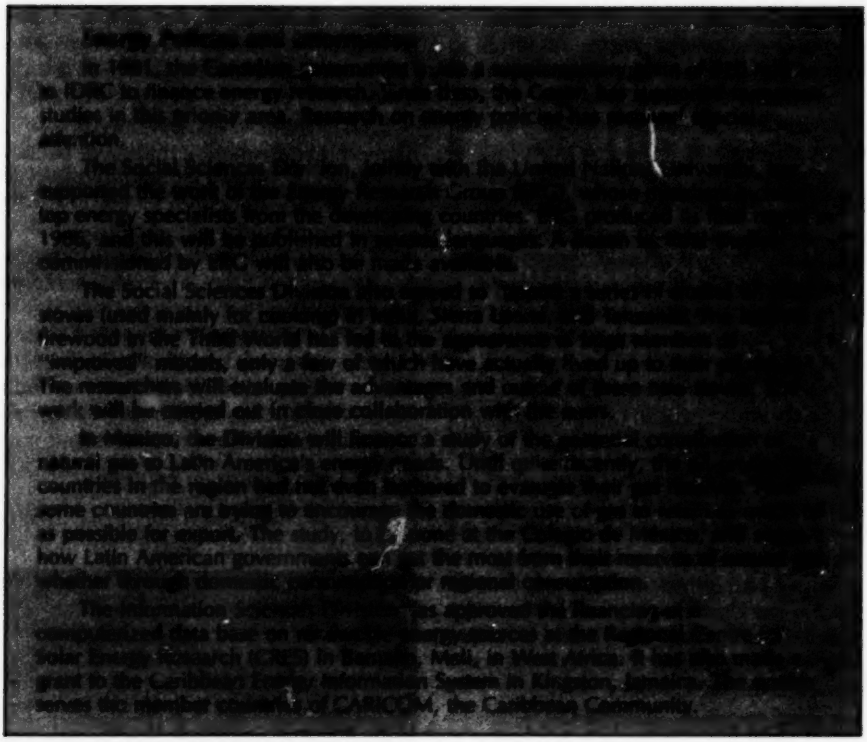
That research team is only one of many in Latin America that have been supported by the Social Sciences Division and have recently made major contributions to the economic policies of their countries. In Argentina and Peru, the Austral and Inti plans also drew largely on the work of researchers supported by IDRC. It is also worth noting that outside of Latin America, specifically in Tanzania in East Africa, some of the recommendations of IDRC-supported researchers have been accepted by governments.

A Latin American Economy

Whether in Latin America, Africa, or Asia, the Social Sciences Division is



Only a few improved stoves have actually lived up to their promises.



seeking ways to ensure that its grants have the maximum possible impact. In areas where research is taking its first, faltering steps, the Division begins by supporting promising individual work. Conferences are then held to give researchers an opportunity to share their experience. As the results come in, common patterns begin to emerge. Finally, more meetings enable scientists to sketch theories that will become the subject of further experiments in other parts of the developing world. In the specific case of the macroeconomics research supported by the Division, a meeting of Latin American researchers is planned for January 1987 in Bogotá. It should constitute a major step in the development of an original economic strategy for Latin America. There have also been several occasions on which the Latin Americans have had the opportunity to meet African economists who are also working on macroeconomic models.

Contract Farming

In 1986, the Division funded an ambitious research project on contract farming in seven countries. It represents one of IDRC's chief contributions to economic research in Africa. In contract farming, a food-processing firm supplies seeds, fertilizers, and pesticides to farmers. Each farmer, in exchange, agrees to sell the harvest to the firm at a price agreed upon beforehand. Sometimes firms will even provide start-up credit, and they nearly always make arrangements to train the farmers in the use of any new agricultural technologies involved.

In East Africa, the Kenya Tea Development Authority is often pointed out as an example because of its success in mobilizing producers. In several other

Southern and East African countries, there is a wide variety of contract farming arrangements, most of them centering on export crops such as cotton, tea, coffee, sugar, or even tobacco. Many countries are attracted to this kind of contract farming because it avoids fragmenting the country into plantations with a colonial aura and leaves the initiative with the farmers. Mobilizing thousands of peasants to produce export crops also helps to pay the foreign debt. All these reasons make it likely that there will be a large increase in the number of projects dealing with contract farming.

Although at first sight it would seem that the results of contract farming are advantageous, there has never been an in-depth study of the benefits to small-scale farmers. The multicountry study that the Social Sciences Division has agreed to finance will enable teams from Kenya, Lesotho, Malawi, Swaziland, Tanzania, Zambia, and Zimbabwe to survey and assess national contract agriculture projects. Publications will then be produced and discussions held to give researchers an opportunity to pool the results. The intention is to have an exhaustive and accurate picture of contract agriculture by the end of the 2-year project. In the long run, decision-makers in Latin America and Asia, where contract agriculture is beginning to spread, will also benefit from the work done in Africa.

Rural Economists

Agricultural production in several of the West African countries is stagnant, even in decline. Despite this, there are few studies of regional agricultural economics and most of those that are available are the work of expatriates.

Four divisions at IDRC — Agriculture, Food and Nutrition Sciences; Social Sciences; Fellowships and Awards; and Communications — have joined forces to support 16 agricultural economics research projects in the French-speaking countries of West Africa. The projects will be grouped into two networks: one on the economics of agricultural production, the other on the economics of marketing. The project leader and two coordinators will be based at the Centre ivoirien de recherches économiques et sociales in Abidjan, Ivory Coast. There will be a major seminar at the beginning of the project and one 3 years later when it ends. Visits by the coordinators will help break down the isolation of the researchers and facilitate the comparison of results. Because the problems under study are directly linked to regional priorities, the results of the 16 studies will be published in short, concisely written leaflets for the use of policymakers in the region.

For Lack of Schools

Last year, the Social Sciences Division provided support for a series of research projects on preschool education in countries in Latin America, Asia, and the Middle East. All these projects are linked by one issue: how to counter the educational handicap of children from underprivileged environments. In some countries — Chile, for example — the schools don't even play their traditional role as agents of equal opportunity. The Chilean government has asked municipalities and the private sector to take over education. The result has been a considerable drop in the quality of instruction and professional train. .g in underprivileged districts.

Now, poor communities find they have to mobilize their own resources as best they can, without waiting for the state to do anything. The Centre for Educational Research and Development (CIDE) in Santiago can continue to rely on IDRC support to pursue its research into new methods such as enlisting family support to compensate for poor-quality schooling. A number of innovative experiments have amply demonstrated the relevance of preschool instruction programs. The Centro de Estudios y Atención del Niño y la Mujer (CEANIM), for example, has set up a network of

preelementary schools in the poorest districts of Santiago and is getting ready to establish similar programs in other marginal communities in the country. IDRC has agreed to support an evaluation of CEANIM's efforts.

Parallel Nursery Schools

In Ecuador, the Indian communities in the provinces of Chimborazo, Cotopaxi, and Imbabura have their own network of nursery schools, the "Guagua-Huasis." This informal and adaptable network functions in parallel with the government-run system. The Social Sciences Division will finance a comparative study of the two networks done by the Instituto de Investigaciones Socio Económicas y Tecnológicas in Quito. Because the government has been forced to reduce its grants to preelementary establishments, the study's conclusions should help to determine how best to use the available resources. Decision-makers in Jamaica and on the West Bank of the Jordan River are also awaiting the results of IDRC-financed studies on preschool establishments.

In China too, where one-tenth of the population is under the age of 6, the Social Sciences Division will finance an evaluation of the present structure of preschool instruction. At the end of 1985, China had 172 300 nursery schools attended by 14 796 900 children, a total 14.3% higher than that in 1984. The evaluation will enable researchers at the Central Educational Research Institute in Beijing to visit 70 000 families in 10 provinces of China between April and November 1987.

1.2 Billion by the Year 2000

Every time China has a census, the whole world holds its breath. The next one will be in 1990, and Chinese census takers will be better prepared than ever before.

In October 1983, IDRC financed a detailed demographic inquiry in Hebei and Shaanxi provinces and in the city of Shanghai. Last year, it once again gave its support to the State Bureau of Statistics in Beijing for a new series of detailed inquiries in five more provinces and another major Chinese city.

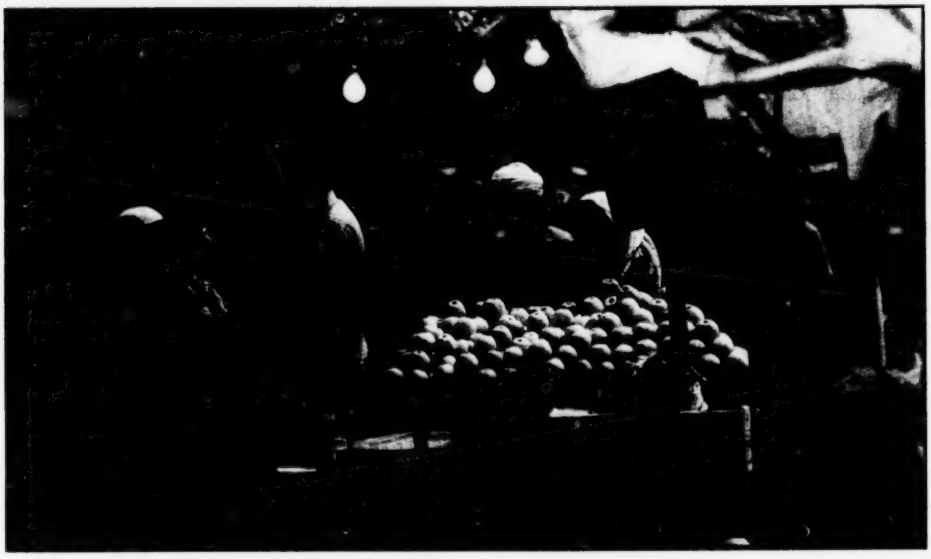
These pilot studies provide training for a great many people in the most advanced methods of inquiry and demographic analysis. Consequently, it is expected that the 1990 census will be extremely accurate. Its results will help to determine just how realistic a goal Chinese population planners have set for themselves. Their aim is to stabilize the population (currently about 1 billion) at 1.2 billion by the year 2000.

Since 1953, the Chinese government has been trying to reduce fertility by raising the age of marriage and encouraging birth spacing. In 1986, the government began to offer couples strong inducement to limit themselves to one child. In 1953, the annual birth rate stood at 37/1000. By 1979, it had fallen to nearly 18/1000. Is the intransigence of the Chinese authorities in their demographic planning justified? Are there not less coercive ways of achieving the same objectives?

There exists a considerable mass of statistics designated "secret" on the population of numerous regions at various times during the last 30 years. In a joint study by the Institute for Information and Control in Beijing and the Centre for Contemporary Asian Studies in Hong Kong, a large number of these unpublished statistical documents will be assembled. This will enable Chinese demographers to link various socioeconomic contexts with birthrates, beginning with the Great Leap Forward (1958–60), through the chaotic Cultural Revolution (1966–76), to the present liberal policy. Chinese authorities will thus be able to examine the impact of past policies objectively and provide a firmer basis for future policies.

The Lot of Refugees

Africa and the Middle East are among the regions where famines and wars have



It may be possible to modernize major parts of the food-processing sector and involve more women at the same time.

produced the most significant demographic upheavals. More than half of the world's refugees have been taken in by countries that are among the poorest in Africa. In Tanzania, the sociology department of the University of Dar es Salaam will study how 36 000 refugees from Rwanda, who settled with government assistance, and 26 000 from Burundi and Zaire, who settled on their own, are managing with regard to finding work and fitting into their new social surroundings. The refugee problem is likely to persist in Africa, and governments and refugee aid organizations will be able to make good use of the researchers' conclusions.

The displaced populations of Lebanon, which are constantly growing, will be the subject of an exceptionally large-scale inquiry to be executed jointly by experts at Saint Joseph University in Beirut and Laval University in Québec. Here, too, the results will be extremely useful, not only to the Lebanese government but also to the numerous international organizations trying to maintain adequate health services for displaced families. The researchers will pay special attention to the educational needs of the children who are in danger of becoming delinquent.

The New American City

The large cities of the industrialized world grew over a period of centuries in response to enormous increases in wealth. Many of the cities of the Third World, however, are simply vast assemblages composed mainly of people with no regular income and no professional skills. Recent economic upheavals have greatly diminished the resources available to municipal authorities in Latin America. How are they to use their meagre means to provide essential services? Would it perhaps be wiser to encourage the establishment of regional urban centres? Urban researchers and planners in Latin America have a great many more questions to ask. Seven teams of researchers, supported by IDRC and coordinated by the Buenos Aires office of the International Institute for Environment

and Development (IIED), based in London, England, will spend 2 years trying to paint an accurate picture of Latin America's cities of tomorrow.

Urban Agriculture

The attraction of urban agglomerations lies mainly in the employment opportunities they offer. Many of these jobs, however, are in the informal sector. In Jamaica, for example, the streets have been invaded by women selling foods. Women researchers at the University of the West Indies in Kingston are going to study the economic context in which these women work. They plan to propose mechanisms to provide the street vendors with access to credit and make it easier for them to purchase supplies.

Sometimes the fruit and vegetables offered for sale on the street are grown nearby. At least 24 municipalities in developing countries have created programs to encourage agricultural production within city limits. City Hall in Addis Ababa, Ethiopia, has encouraged the poor to cultivate vacant lots. In Tanzania, the Social Sciences Division has agreed to support work by researchers at Sokoine University of Agriculture on the potential for urban agriculture.

City Jobs and Country Jobs

There is still, of course, a bright future for farming in the countryside. It will be a long time before consumers prefer sidewalk cabbages to those grown on the farm.

Now that a great many developing countries have increased their food production to the level of self-sufficiency, priorities are changing. In several countries, the most important thing now is to create jobs, tens of millions of jobs. If the cities are to remain manageable and not collapse from overpopulation, most of these new jobs must be created in rural regions and regional centres.

The province of Jiangsu in China has been remarkably successful in creating employment outside the major urban centres. With 60 million inhabitants, it is one of the most populous and prosperous provinces in the country. In 1984, about 30% of Jiangsu's industrial production originated in rural communes, even though the province contains China's largest city, Shanghai, which has a population of 12 million. These remarkable results are to be attributed to the open-mindedness of the authorities. They have permitted the creation of all kinds of cooperatives, private enterprises, and state corporations. They have allowed the market to reward risk takers and many connections have been established between rural industries and urban markets.

Jiangsu Province's Academy of Social Sciences, in cooperation with the Economics Department of the University of British Columbia, will draw up a detailed description of the policies applied by the authorities in obtaining these impressive results. This collaborative effort will enable the Chinese researchers to emerge from their isolation and will give their Canadian counterparts an opportunity to help disseminate the results. A great many countries are keen to learn about Chinese policies that have helped to create nonfarming jobs in rural areas.

Legislative Cooperation

When the authorities of the People's Republic of China legalized the creation of private and mixed enterprises in 1978, they found that they had to write a whole new set of laws. How would they introduce regulations for a market economy into a country with a planned economy? Above all, Chinese legislators urgently needed regulations for corporations and partnerships, securities, product warranties, and so on. This persuaded the Office of the Secretary and General Counsel at IDRC of the importance of financing an experiment in legal cooperation. The research is to be jointly done by specialists from the

Faculty of Law of Queen's University in Kingston, Ontario, and the Centre for Research in Economic Law in Beijing.

Population Resource

One of the constant concerns of IDRC's program officers is to provide Third World scientists with the chance to keep up to date as researchers. Most grants are made to small teams working on specific problems. There are, however, other grants that create important learning situations for young researchers. Three of the Social Sciences Division's grants in 1986 are contributing to the development of new skills in demographic research in Africa and the Middle East, and in science and technology policy research in East Africa.

The demography departments of many sub-Saharan governments are still directed by foreigners or by young people with no training. Ironically, sub-Saharan Africa is the only region of the world where the population growth rate is still rising. The Social Sciences Division will finance training scholarships for 10 Africans to study at the Master's level in demography at the Cairo Demographic Centre in Egypt. In conjunction with the Ford Foundation and the Population Council, both in the USA, the Division will also continue to make numerous scholarships available to young Middle Eastern demographers. During the first phase of this program, half the recipients were women.

Science Policy

The Social Sciences Division has agreed to continue its support for a network of young science and technology policy specialists in Ethiopia, Kenya, Tanzania, Uganda, Zambia, and Zimbabwe. Since 1982, these researchers have conducted about 20 studies on subjects ranging from the technological behaviour of cooperatives to native technology used in alcohol fermentation. Each year they have held a meeting in a different country. Some of them have begun to teach science policy in universities; others are regularly consulted by their governments.

In the long run, the contributions of this new generation of national experts will most likely be invaluable. Consider the expensive and underused hydro plants, grain silos, sugar refineries, and cement factories that clutter up the landscape of Africa and the Third World in general. Just think of what might have been achieved had the millions of dollars that were spent on them been channeled into the use of local skills and technology. It might not have resolved all the problems, but at least valuable local experience would have been acquired.

Inevitably, the best minds in the Third World will play a decisive role in the development of their countries. As for IDRC, it sees its role as that of a catalyst in the development of the most valuable resource the underprivileged regions of the world possess, brain power.

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